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FORT UNION COAL REGION

WERNER TRACT ANALYSIS

SITE SPECIFIC ANALYSIS

PRELIMINARY FACILITY EVALUATION REPORT

DUNN COUNTY, NORTH DAKOTA

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September 1981

Michael J. Penfold
State Director

PREFACE

This document contains a site-specific analysis and a preliminary facility evaluation report. The site-specific analysis discusses the consequences of leasing and mining a particular tract. The preliminary facility evaluation report discusses significant issues associated with an end use coal conversion facility.

There were 24 tracts identified through a screening process under the over-all direction of the Fort Union Region Coal Team. The team consists of federal, state, and local officials. The tracts are being evaluated for potential federal coal leasing for a coal lease sale scheduled for June 1983. The evaluation, called a site-specific analysis, has been completed for each of the 24 tracts.

Historically, development of a new coal mine in the Fort Union Coal Region has been associated with a coal conversion facility power plant in the vicinity of the mine. For this reason, the Regional Coal Team directed BLM to evaluate impacts of a typical facility near each potential mine. A preliminary facility evaluation report was prepared for each facility.

The Fort Union Regional Coal Team will begin ranking and grouping selected tracts into alternative leasing patterns for the 1983 lease sale using information from these individual reports. These groupings of tracts will form the basis for alternatives and a regional environmental impact statement to be developed during 1982. The analysis in this report represents an important step in a lengthy process which takes place prior to any final decision on federal coal leasing within the region.

Of the 24 tracts currently being evaluated, 16 would require the opening of new mines. One of the 16 would be specifically earmarked for small business. The remaining eight tracts constitute coal which would be needed to maintain production or prevent the by-pass of federal coal at an ongoing mining operation.

Approximately 1.6 billion tons of recoverable federal coal lie within the areas being evaluated. Final designation of some areas as unsuitable for mining under the 1977 Surface Mining Control and Reclamation Act will likely reduce the amount of federal coal actually available for leasing and development, and could remove several of the 24 tracts from further consideration. This information will not be available until early 1982.

A major purpose of the site-specific analysis and preliminary facility evaluation reports is to acquaint the public with key issues and consequences of leasing and development of federal coal reserves so that they may (1) offer comments to the Fort Union Regional Coal Team on what areas they consider most important to be evaluated and analyzed in the ranking of the tracts and in the Regional EIS and (2) offer specific advice on what decision alternatives the Coal Team should look at more closely.

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SITE SPECIFIC ANALYSIS

SITE SPECIFIC ANALYSIS

INTRODUCTION

The purpose of this action is to offer 112.0 million tons of federal strippable coal reserves that can be further considered for coal leasing and development to help meet the energy needs of the Nation.

This site-specific environmental analysis has been prepared for the Werner tract (Map 1) in accordance with Federal Regulations (43 CFR 3420). Similar analyses have been written for other tracts of federal coal being considered for leasing in the Fort Union Coal Region. These documents will be used by the regional coal team in determining which tracts to recommend for leasing in 1983. If selected and leased, the Werner tract would contribute 112.0 million tons of federal coal to the regional leasing target. A regional leasing target will be selected in October 1981.

BACKGROUND

In September of 1980, the Dickinson District Bureau of Land Management (BLM) Office completed the West-Central North Dakota Management Framework Plan (MFP) for Oliver, Mercer, McLean, Stark, and Dunn counties, and a small part of Billings County. The land use planning process included identification of high or moderate potential coal areas, application of unsuitability criteria, identification of resource trade-offs, and consultation with surface owners. As a result of that work, areas were identified that could be further considered for coal development. These areas are available for consideration for new competitive leasing, lease exchanges, and lease modifications.

Following land use planning, the BLM requested expressions of interest from industry. These expressions, along with other information, guided the U.S. Geological Survey (USGS) in delineating this tract. Results of that work are summarized in this document.

The BLM Dickinson district staff inventoried the tract to determine the site-specific resource values and then analyzed potential environmental effects of coal development on this tract. Among other things some of the unsuitability criteria were further considered. Any new findings are reflected in this report.

Information from this and other site-specific analyses (SSAs) will be used by the Regional Coal Team during the tract ranking and selection process for a lease sale schedule. The proposed tracts will be cumulatively analyzed in a regional environmental impact statement. Among the alternatives adressed will be different combinations of tracts that meet a regional coal leasing target.

After reviewing the analytical documents, public comments, and the recommendations of the Regional Coal Team, The Secretary of the Interior will select specific tracts for the lease sale. The successful lessee will be required to submit a plan for mining and reclamation to the Office of Surface Mining (OSM) for review and approval within three years after leasing. In evaluating the plan, OSM will prepare a site-specific environmental assessment or EIS.

Tracts in the Fort Union Region are being considered for leasing in accordance with the federal coal management program adopted by the Secretary of the Interior in June 1979. The basis for the program was, in part, the Final Environmental Statement, Federal Coal Management Program. Implementation procedures are contained in Federal Regulations. (43 CFR 3400). Authorizing actions are the Mineral Leasing Act of 1920, as amended; The Mineral Leasing Act for Acquired Lands of 1947, as amended; the Federal Land Policy and Management Act of 1976; the Surface Mining Control and Reclamation Act of 1977; the Multiple Mineral Development Act of 1954; the Department of Energy Organization Act of 1977; the National Environmental Policy Act of 1969; the Federal Coal Leasing Amendments Act of 1976, as amended; and federal regulations concerning federal coal leasing and development, including 43 CFR 3400, 30 CFR 211, and 30 CFR 700-899.

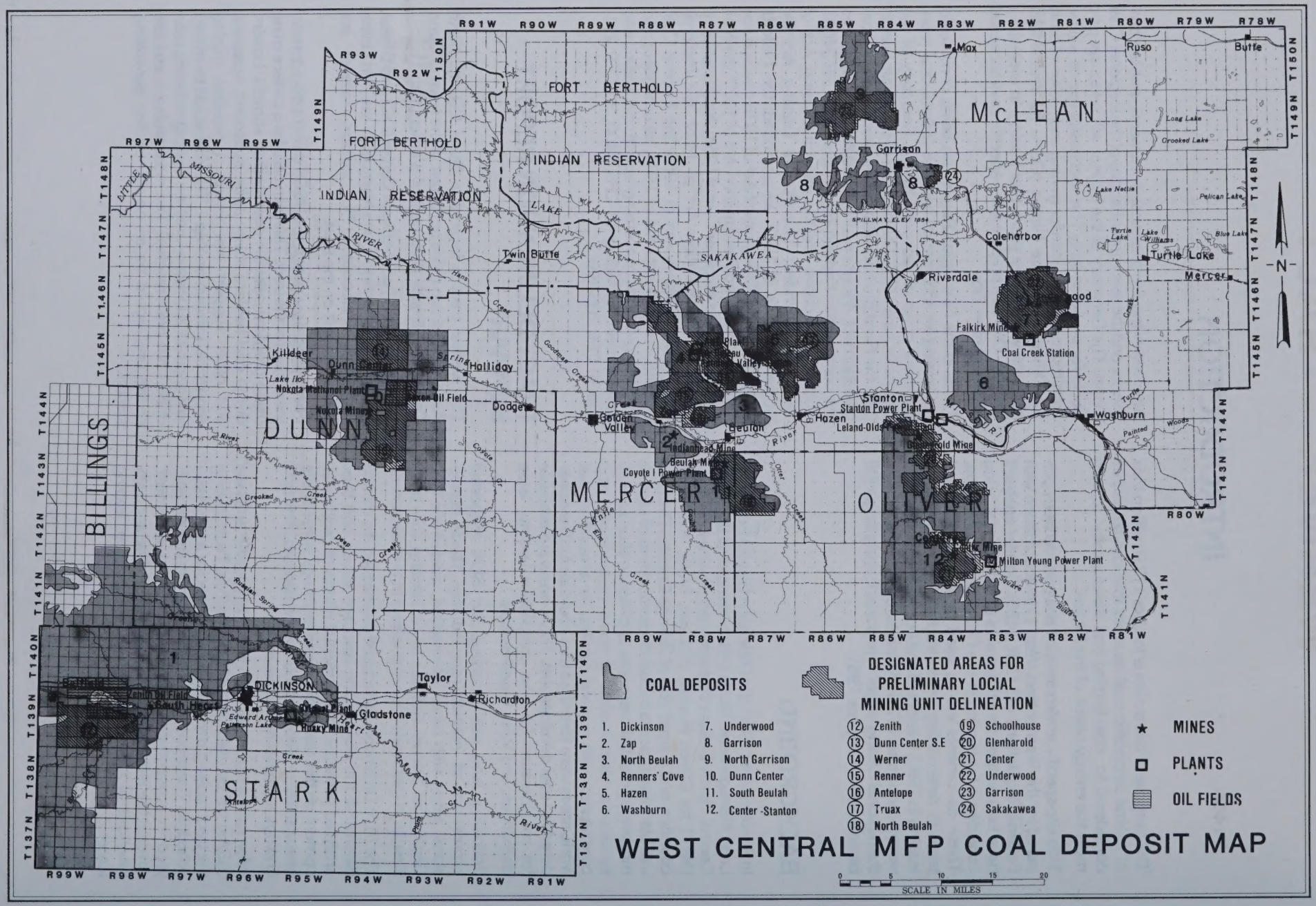
TRACT DELINEATION REPORT SUMMARY

The Werner tract is located in Dunn County, North Dakota about two miles northeast of the town of Dunn Center and directly northwest of Werner (Map 1).

The tract is based on the Dunn Center (DC) and B beds founds in the Sentinel Butte Member of the Fort Union Formation (Paleocene). No geologic hazards are known to exist on the tract.

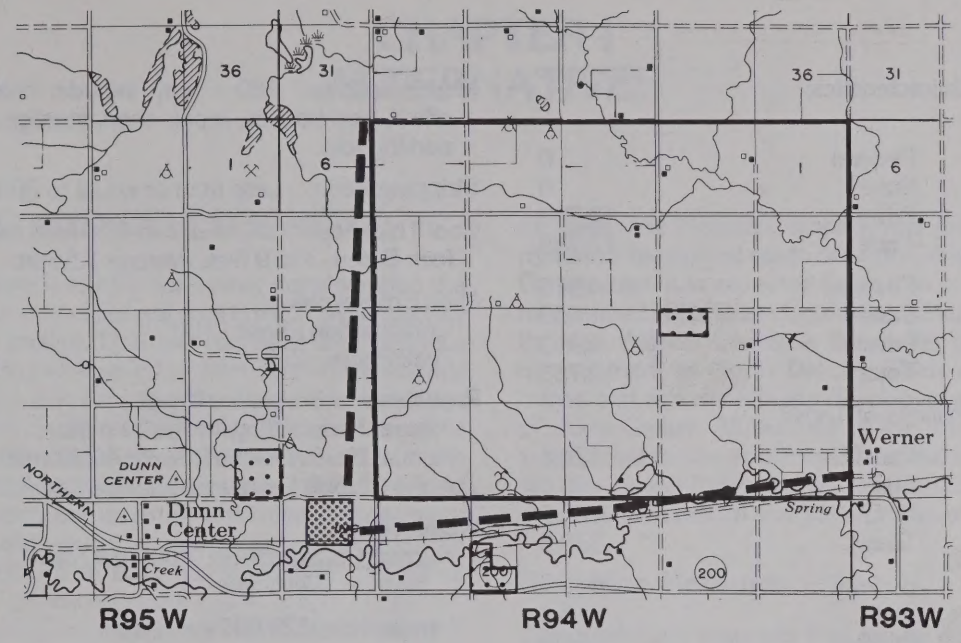
For analytical purposes, the USGS developed a generic mine plan for the tract. This plan calls for a surface mine using draglines, electric coal loading shovels, bottom dump coal haulers, rotary drills, bulldozers, scrapers, and other support equipment. A possible mining sequence is shown on Map 2. The coal would be mined to a depth of 200 feet or until the limiting stripping ratio of 20:1 has been reached. The most probable end use of the coal would be an on-site electric generating station.

MAP 1



WEST CENTRAL MFP COAL DEPOSIT MAP

WERNER TRACT

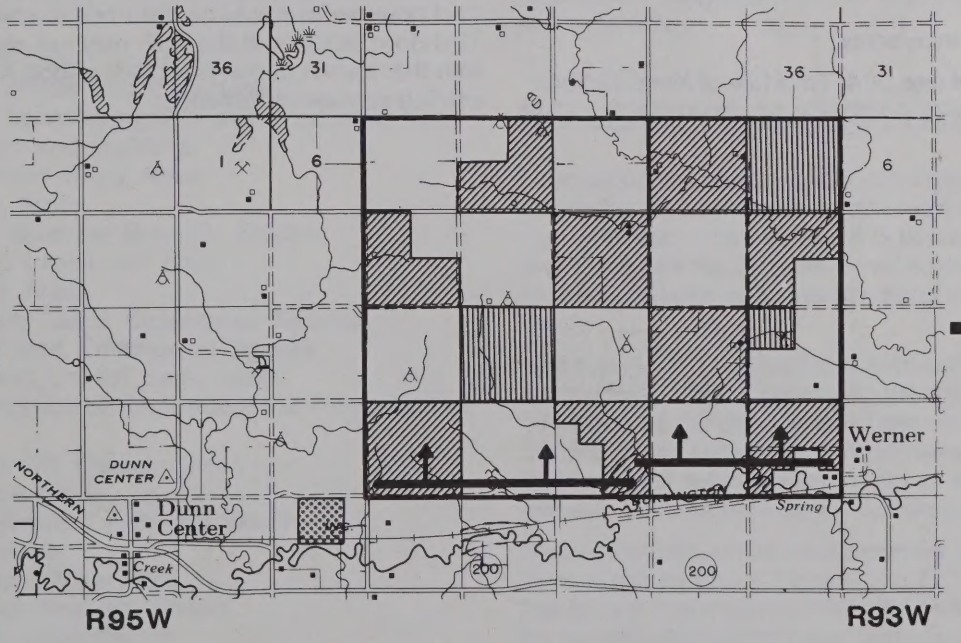


SURFACE OWNERSHIP

LEGEND

- Private Surface
- Surface Owner Nonconsents
- Tract Boundary
- Federal Coal
- State Coal
- Private Coal

-N-



SUBSURFACE OWNERSHIP

- Surface Facilities
- Out-of-Pit Haul Roads
- Pit Advancement

1 0 1 2 3 4 5 6

Scale In Miles

MAP 2

Specific Tract Characteristics:

Acreage:		
Surface:	Federal	0
	State	0
	Private	12,788
	Total:	12,788
Coal:	Federal	4,915
	State	960
	Private	6,913
	Total	12,788

Coal Reserves/Millions of Tons:

In Place:	Federal	124.4
	State	30.4
	Private	185.5
	Total	330.3
Recoverable:	Federal	112.0
	State	18.4
	Private	166.9
	Total:	286.3

Coal Quality: Average of samples as received from vicinity of tract:

Moisture	34.0%
Volatile matter	27.0%
Fixed carbon	29.0%
Ash	8.0%
Sulfur	0.8%
BTU's/lb	6,800

Surface Disturbance/acres

Mining: Annual rate, 314; Total Life of Mine, 12,594

Haul Roads: 112

Mine Facilities: 160 - may include: changehouse, office, warehouses, repair shed, storage areas, and parking lots.

Stripping Ratio: Less than or equal to 20:1

Coal Thickness: DC bed, 7 to 18.5 feet, average 10.6 feet; B bed, 3 to 9 feet, average 7.5 feet.

Mine Employment:
Construction Phase - 180
Peak Phase - 225

Royalties and Severance Taxes:
Annual Federal Royalty, $2.09 million
Annual North Dakota Royalty, $0.34 million
Annual North Dakota Severance Tax, $6.66 million

Water Needs:
Human Consumption, 7,000 gal./day
Source: Well water

Nonpotable, 120,000 gal./day
Source: Lake Sakakawea

For more specific information on the proposed mining operation refer to the engineering, geologic, and land reports prepared by the tract delineation team.

NOTE: As the mine plans developed by USGS are of a generic nature and the actual mining sequence will be developed by the mining companies to fit their individual needs, the Resource Specialist assigned to the SSAs made the assumption that all lands within the tract boundaries would be disturbed to some degree. Therefore, acreage in the SSA may not always agree with that shown in the Tract Delineation Report concerning acreage disturbance.

CHAPTER I
ALTERNATIVES

LEASING AND DEVELOPMENT

This alternative is to offer for further consideration the 112.0 million tons of federal coal in the Werner tract for competitive leasing. This tract has been identified as a logical mining unit for a 7.4 million ton per year surface mine having a 40-year mine life. The Werner tract has been delineated within areas designated as acceptable for further consideration in the West-Central North Dakota MFP adopted in September 1980. The tract does not include any lands for which the surface owner has filed a valid refusal to consent (to mining) prior to March 1, 1981. The tract has been fully cleared of unsuitability criteria numbers 1, 2, 4, 5, 6, 8, 10, 11, 12, 13, 17, 18 and 20 as defined in 43 CFR 3461. Criteria 7, 9, 14, 15 and 16 require further study. With the exception of criteria 3 and 19, all unsuitability criteria studies will be completed and fully applied before work begins on the final regional environmental impact study. If not, this tract will be dropped from further consideration. Criteria 3 and 19 will be deferred until mining and reclamation plans are submitted to the Office of Surface Mining and North Dakota Public Service Commission for final approval. Current unsuitability concerns are shown on Map 3. The following is a list of unsuitability criteria.

(1) Federal Land System
(2) Rights-of-Way and Easements
(3) Buffer Zones along R/W and Adjacent to Communities and Buildings
(4) Wilderness Study Areas
(5) Scenic Areas
(6) Lands Used for Scientific Studies
(7) Historic Lands and Sites
(8) Natural Areas
(9) Federally Listed Endangered Species
(10) State Listed Endangered Species
(11) Bald and Golden Eagle Nests
(12) Bald and Golden Eagle Roost and Concentration Areas
(13) Falcon Cliff Nesting Sites
(14) Migratory Birds
(15) State Resident Fish and Wildlife
(16) Floodplains
(17) Municipal Watersheds
(18) National Resource Waters
(19) Alluvial Valley Floors
(20) State Proposed Criteria

Relationship to Other Developments

Farming and ranching are the significant activities in the area. The Nokota Company has proposed a coal methanol facility just south of Dunn Center in the Dunn Center tract. It is expected to go into operation in the mid to late 1980s. Dunn County joins Mercer County on the east. Mercer County is the center of coal energy development in North Dakota. There are six active mines and one mine being developed within 60 miles of Dunn Center. All but one of the mines are or will supply coal to power plants. The closest active mines are the Husky Industries and the Indianhead mines about 30 miles south and 30 miles east of Dunn Center.

Mitigation Measures

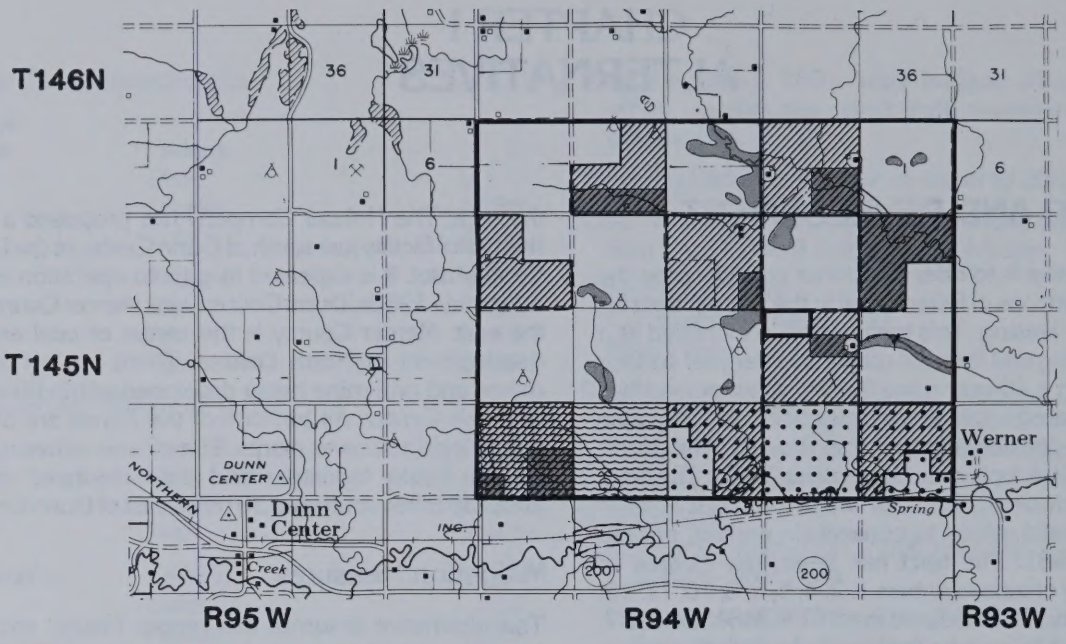
This alternative assumes that proper mining and reclamation would be carried out according to existing state and federal regulations. These include: OSM Reclamation and Enforcement regulations (30 CFR 700-899), Environmental Protection Agency regulations (40 CFR 0-1399), Council of Environmental Quality regulations (40 CFR 211), Department of Interior coal management regulations (43 CFR 23 and 3400), North Dakota Public Service Commission laws and regulations (Chapter 38-14.1 of the North Dakota Century Code and Article 69-05.2 of the North Dakota Administrative Code).

NO LEASING ALTERNATIVE

Federal coal would not be offered for leasing under this alternative. Federal reserves represent about 38 percent and state reserves about 6 percent of the coal available in the tract. If federal coal is not leased, development of a large economical mining unit is not feasible.

There were no small business expressions of leasing interest for the area. Considering the amount of federal coal involved, the checkerboard pattern of federal coal ownership and the apparent trend in small mine development, near future development of any small coal mines in the tract boundary is not likely.

Should the tract not be considered for further leasing, there would be about 7 percent or 112.0 million tons less federal coal available within the Fort Union Region for consideration in tract selection to meet the federal leasing target. Also about 18.4 million tons of state and 166.9 million tons of private coal would be lost for possible production in the region. As discussed in Chapter II, few significant changes to the existing environment would be expected during the next 40 years.



LEGEND

Federal Coal

Areas being considered as unsuitable by BLM and others

based on existing information.

Wildlife Habitat

Areas of Potential Archaeological Value

Potential Dwellings

Area Contains Multiple Resources — alluvial valley floor, 100-year flood plain, wildlife habitat and archaeological values.

Note: Detailed maps are available for inspection at the Dickinson BLM District Office. (Rights-of-way too numerous to show.)

1 0 1 2 3 4 5 6

Scale In Miles

-N-

WERNER TRACT

MAP 3

CHAPTER II
AFFECTED ENVIRONMENT

This section is a description of the current environment with anticipated changes from ongoing trends. Within the Williston Basin there has been an increase in oil and gas exploration, and this trend is expected to continue. The physical resources described in this section represent only existing conditions while the social and economic sections account for existing conditions and ongoing trends. It is recognized that the physical resource values may change due to future oil and gas exploration.

TOPOGRAPHY

The Werner tract is situated on the glaciated Missouri Plateau of the Great Plains physiographic province, and is characterized by gently rolling hills and scattered buttes. The local relief is about 200 feet. The area is drained by Spring Creek which flows eastward along the southern boundary of the tract.

GEOLOGY AND MINERALS

The Sentinel Butte Member of the Fort Union Formation (Paleocene) forms the bedrock in the tract. In this area, the Sentinel Butte is composed of interlayered beds of poorly consolidated sandstone, siltstone, claystone, limestone, and coal, including the two beds discussed in this analysis. The Sentinel Butte is overlain by scattered areas of glacial erratics.

Two coal beds form the mineable coal reserves in this area. The DC bed is the major resource in the tract, with the overlying B bed accounting for 40 percent of the total reserves. Within the tract, the DC bed ranges from 7 to 18.5 feet thick and averages 10.6 feet. Interburden between the DC and B beds ranges from 23 to 116 feet. The thickness of the B bed ranges from 3 to 9 feet with an average of 7.5 feet.

The tract contains a total of 12,788 acres of land underlain by a total of 330.3 million tons of reserve base coal (124.4 million tons federal, 185.5 million tons private, and 20.4 million tons state).

No oil and gas are produced on this tract but there has been seismic exploration in the area and some exploratory drilling.

PALEONTOLOGY

No fossils of scientific importance are known to occur on this tract.

SOILS AND RECLAMATION POTENTIAL

The soil in the Werner tract is primarily derived from shale, siltstone, and sandstone parent material either in place (Verbar, Amor) or reworked by wind and water (Parshall). There is some soil from glacial till (Williams) and wind blown material over the till (Flaxton). Alluvial soils such as Arnegard, Straw, and Daglum are scattered throughout the tract.

The Vebar, Vebar-Parshall, Amor, Williams, and Flaxton-Williams mapping units occupy nearly level to strongly sloping uplands (Table 1). Typically they are moderately-deep and deep, well-drained, loamy and coarse loamy soils of moderate to high natural fertility.

The alluvial soils are found on level floodplains and terraces, and nearly level to gently sloping uplands, and swales on uplands. Straw and Arnegard are deep, well-drained, loamy soils of high fertility. Daglum is deep, moderately well-drained, fine textured soil of rather low natural fertility.

The wind erosion potential is high over much of the tract due to the extensive Vebar and Vebar Parshall fine sandy loams. Susceptibility to water erosion is moderate to high over most of the tract because of the common moderate to strongly sloping topography.

The quality of soil within the tract is reflected in the soil suitability for final cover of surface-mined land ratings and acreage figures for the SCS Order II county soil survey mapping units in the tract (Table 1 and 2). Of the 12,800 acres involved, 8,358 acres (65%) is in the "good" suitability category, 3,456 acres (27%) "fair," and 986 acres (8%) "poor." The Vebar-Parshall, Williams, Straw, and Amor mapping units compose much of the acreage rated "good." Vebar fine sandy loam is the most common unit rated "fair." The Daglum, Rhoades, and Harriet units make up most of the "poor."

The tabulation of acreage appears by surface landowner in Table 2 because North Dakota law does not allow the transfer of soil material from one landowner to another unless written consent is given. Each surface owner's land must be reclaimed with soil originally removed from his holdings. The table therefore indicates the degree of difficulty to reclaim individual landowner holdings, based on soil suitability for cover of surface-mined land.

TABLE 1
SOILS - WERNER TRACT

Map Symbol and Soil Mapping Unit Name[1]	Percent Slope[1]	Soil Erosion Potential[1] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2]	Soil Hazard Conditions[2]
3 - Straw loam, channeled	0-1	Low	High	Good	-----
4 - Arnegard loam	1-3	Low	Low	Good	-----
4B - Arnegard loam	3-6	Low	Mod	Good	-----
7 - Straw-Rhoades loams	0-1	Low	Low	Fair	Rhoades-clayey subsoil excess sodium and salts
8C - Cabba-Chama silt loams	6-9	Low	High	Fair	Cabba-too alkaline, some lime
9D - Amor-Cabba loams	9-15	Low	High	Fair	Cabba-too alkaline, some lime
9E - Cabba loam	15-45	Mod	High	Fair	Cabba-too alkaline, some lime
13D - Wabek gravelly loam	1-15	Mod	Low-Mod	Fair	Excess small stones, droughty, sandy subsoil
15 - Belfield-Farland silt loams	1-3	Low	Low	Fair	Belfield-clayey subsoil with excess sodium and salts
16B - Belfield-Savage silty clay loams	1-6	Low	Mod	Fair	Too clayey; Belfield-sodium and salts in subsoil
18 - Belfield-Grail silty clay loams	1-3	Low	Low	Fair	Too clayey; Belfield-sodium and salts in subsoil
19B - Belfield-Morton silt loams	1-6	Low	Mod	Fair	Belfield-clayey subsoil with excess sodium and salts

TABLE 1
SOILS - WERNER TRACT

Map Symbol and Soil Mapping Unit Name[1]	Percent Slope[1]	Soil Erosion Potential[1] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2]	Soil Hazard Conditions[2]
27B - Farland silt loam	0-1	Low	High	Good	----
29B - Farland-Rhoades silt loams	1-6	Low	Mod	Fair	Rhoades-clayey subsoil with excess sodium and salts
30E - Cohagen-Vebar fine sandy loams	9-25	High	High	Fair	Cohagen-too alkaline, droughty
32B - Flaxton-Williams complex	1-6	High	Mod	Good	----
32C - Flaxton-Williams complex	6-9	High	High	Good	-----
33 - Grail silt loam	1-3	Low	Low	Fair	Clayey subsoil
33B - Grail silt loam	3-6	Low	Mod	Fair	Clayey subsoil
41 - Heil silty clay loam	0-1	Low	Low	Poor	Too clayey, excess sodium
44B - Lihen loamy fine sand	1-6	High	Mod	Fair	Too sandy
45B - Ruso sandy loam	1-6	High	Mod	Fair	Too sandy
46B - Bowdle loam	3-6	Low	Mod	Good	-----
49B - Morton silt loam	3-6	Low	Mod	Good	-----
51C - Amor extremely stony loam	1-9	Low	Mod	Fair	Excess stones
52B - Morton-Rhoades silt loams	1-6	Low	Mod	Fair	Rhoades-clayey subsoil with excess sodium and salts

TABLE 1
SOILS - WERNER TRACT

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
54B - Parshall fine sandy loam	1-6	High	Mod	Good	-----
61C - Regent-Rhoades silt loams	6-9	Low	High	Fair	Too clayey; Rhoades-excess sodium and salts
62B - Rhoades silt loam	1-6	Low	Mod	Poor	Clayey subsoil with excess sodium and salts
69B - Savage-Rhoades silty clay loams	1-6	Low	Mod	Poor	Too clayey; Rhoades-excess sodium and salts
70C - Searing loam	3-9	Low	High	Good	----
71B - Sen silt loam	3-6	Low	High	Good	-----
71C - Sen silt loam	6-9	Low	High	Good	-----
75 - Straw loam	0-1	Low	Low	Good	-----
81B - Vebar-Parshall fine sandy loams	1-6	High	Low	Good	-----
81C - Vebar-Parshall fine sandy loams	6-9	High	High	Good	-----
81D - Vebar fine sandy loam	9-15	High	High	Fair	Surface sometimes too sandy
82D - Vebar extremely stony sandy loam	3-15	High	High	Fair	Excess stones
86F - Brandenburg-Cabba loams	6-50	Mod	High	Poor	Brandenburg-excess rock fragments; Cabba-too alkaline, some lime

TABLE 1
SOILS - WERNER TRACT

Map Symbol and Soil Mapping Unit Name[1/]	Percent Slope[1/]	Soil Erosion Potential[1/] Wind	Water	Overall Suitability of Soil for Use as Cover-Soil Material in Surface-Mine Reclamation[2/]	Soil Hazard Conditions[2/]
88 - Willimas loam	1-3	Low	Mod	Good	-----
88B - Williams loam	3-6	Low	Mod	Good	-----
88C - Williams loam	6-9	Low	High	Good	-----
90C - Williams extremely stony loam	1-9	Low	Mod-High	Fair	Excess stones
93E - Zahl-Williams loams	15-25	Mod	High	Fair	Clayey subsoil, some lime
94B - Moreau Variant clay loam	1-6	Low	Mod	Fair	Too clayey
101B - Amor loam	3-6	Low	Mod	Good	-----
101C - Amor loam	6-9	Low	High	Good	-----
102 - Shambo loam	1-3	Mod	Low	Good	-----
102B - Shambo loam	3-6	Low	Mod	Good	-----
105 - Harriet silt loam	0-1	Low	Low	Poor	Excess sodium and salts
106B - Daglum silt loam	1-6	Low	Low	Poor	Clayey subsoil with excess sodium and salts

1/ From Manuscript of "Soil Survey of Dunn County, North Dakota".

2/ Derived by applying the properties of the soils within the tract which are described in the above mentioned soil survey report manuscript and "Official Soil Series Descriptions" to the guidelines developed by BLM-Montana State Office and adapted from information by Wm. Schafer, the Soil Conservation Service (SCS), and the Office of Surface Mining (OSM).

TABLE 2
SUITABILITY OF SOIL FOR RECLAMATION BY LANDOWNER ON THE WERNER TRACT

LANDOWNER NUMBER	ACRES GOOD	FAIR	POOR	TOTAL
1	157	163	0	320
2	247	66	7	320
3	237	71	12	320
4a	70	57	33	160
b	255	36	29	320
5	118	42	0	160
7	22	7	11	40
8	132	10	18	160
9	133	27	0	160
10	123	37	0	160
11	133	27	0	160
12	293	27	0	320
13	56	4	20	80
14	164	34	2	200
15	385	82	13	480
16a	364	150	126	640
b*	67	21	72	160
c	157	3	0	160
d*	26	32	102	160
e	430	151	59	640
17	156	4	0	160
18a	814	466	0	1,280
b	152	8	0	160
c	399	26	55	480
19a	164	156	0	320
b	177	183	0	360
20	286	34	0	320
21*	36	7	37	80
22	8	20	12	40
23	17	23	0	40
24a	259	61	0	320
b	134	26	0	160
c	160	0	0	160
25	142	18	0	160
26	101	59	0	160
27a	115	45	0	160
b	177	123	20	320
28	128	307	5	440
29	190	50	80	320
30a	82	63	15	160
b	79	51	30	160
31a*	39	49	72	160
b	181	159	140	480
32	159	1	0	160
33	110	50	0	160
34	228	92	0	320
35a	206	262	12	480
b	90	66	4	160
TOTALS	8,358	3,456	981	2,800
% OF TOTAL	65%	27%	8%	100%

1/ Based on Table 1. Planimetry by BLM. Legal description of land and owner made corresponding to landowner number available at Dickinson District Office.
*Indicates individual landowner tracts that have nearly half or more of the acreage rated "poor" for use as cover soil material in surface-mine reclamation.

HYDROLOGY

Surface water runoff drains from this tract through North Creek, direct tributaries of Spring Creek, and an unnamed creek, into Spring Creek which then flows into the Knife River. Annual runoff in this area averages about one inch. Table 3 shows the percentage of watershed area covered by the tract plus any additional area affected by facilities, haul roads, etc. Also shown are estimates of annual surface water yield.

TABLE 3
WATERSHED AREAS ON THE WERNER TRACT

Watershed	Area (miles²)	% of Watershed to be Disturbed	Annual Water Yield (acre-feet)
North Creek	43.3	20.8	2,309
Unnamed Creek	32.6	6.1	1,739
Direct Trib. Spring Creek	13.3	85.0	709
Spring Cr. near Halliday	260.0	8.6	13,867

The surface water is typically a sodium sulfate type. During low flow periods the quality of water in Spring Creek equals or exceeds the state standards for sulfate concentration, percent sodium, and total dissolved solids. Surface water is used within the affected area for stockwater. Just downstream from the tract, water from Spring Creek is used for irrigation.

In ascending order above the Pierre Shale, the Fox Hills—Hells Creek, Ludlow, Coleharbor, and lignite and sand beds of the Tongue River and Sentinel Butte formations are aquifers that occur beneath this tract. Buried glacial meltwater channels of the Coleharbor formation and sand and lignite beds above the DC lignite of the Sentinel Butte formatiom form aquifers that occur within the mine disturbance zone.

Both the A and Dunn Center lignites, as well as other coarse textured beds near these, are saturated in the tract. A buried channel of glacial origin underlies Spring Creek, dissecting all of the lignite beds.

The flow system for the aquifer network is local in extent. Recharge is from precipitation and infiltration in streams and ponds. The flow direction is down through the consolidated deposits. The buried channel is lower than the DC lignite and drains these shallow aquifers.

Groundwater quality is typically a sodium sulfate bicarbonate type. In and surrounding this tract shallow groundwater is used for domestic and stock water supplies. The A and DC lignites are primary sources of shallow groundwater.

VEGETATION AND AGRICULTURAL PRODUCTION

The Werner tract is extensively used for agricultural

purposes. Dryland farming methods, most notably alternate-year summer fallow-cropping rotations, are widely practiced in the area. Four percent, 543 acres, is fallowed each year (Table 4).

TABLE 4
AGRICULTURAL LAND USE
ON THE WERNER TRACT

Land Use:	Tract Acres	Average Production Per Acre 1/	Total Annual Production
Cropland	3,141	25.6 bu.	80,410 bu.
Hayland	2,526	1.30 tons	3,284 tons
Range	6,328	.5 AUM	3,164 AUMs
Other	305	1.30 tons	397 tons
Fallow	543	n/a	n/a
Total	12,843	n/a	n/a

1/ Crop : wheat equivalent bushels/acre
Hayland: tons/acre
Range : AUMs/acre
Other : tons/acre of hay equivalent

Small grains, in descending order of acreage, include spring wheat, oats, corn, sunflowers, barley, winter wheat, durum, flax, and rye which are grown on 3,141 acres (25 percent) of the tract. Wheat yields average 25.6 bushels per acre. Much of the cropland production, especially the wheat portion, is sold as a cash crop. Oats, barley, and corn are also used as feed grains in livestock operations.

Twenty percent, 2,526 acres, of the tract is used for growing hay for use in overwinter livestock feeding. Approximately 1.3 tons of hay are produced per acre.

Forty-nine percent, 6,328 acres, is rangeland and pastureland. Rangeland produces about .5 Animal Unit Months (AUMs) per acre. An AUM is the amount of forage needed to support a cow/calf for one month. Beef cattle are the predominant kind of livestock (North Dakota Crop and Livestock Reporting Service 1980). There are also some dairy cattle, hogs, and sheep raised.

There are approximately 20 acres of shelterbelts, field windbreaks, and farmsteads per operation. There are a few woody draws in the tract which contain native trees and shrubs.

Except for reseeded areas, the rangeland is in the widespread Mixed Grass Prairie type (Shaver 1977). This includes species such as needle-and-thread, little bluestem, prairie sandreed, western wheatgrass, blue grama, side-oats grama, plainsmuhly, sedges, snowberry, fringed sagewort, and silver sage.

No threatened or endangered plant species as published on the 1980 federal list have been identified in the tract.

There are 20 operators and operator partnerships in the tract (Table 5). Operations range in size from 40 acres to 4,960 acres inside the tract and from 320 acres to 9,259 acres in total. Sixty percent of the operators have less than thirty percent of their operations within the tract (Table 5). Three operations have more than fifty percent of their acreage within the tract. Overall, the tract covers thirty percent of the acreage of the operations involved.

Agriculture in the area includes crop and livestock operations, and mixtures of both. Most operations in the area include a balance between the two.

Fifty-nine percent of the acreage within the tract is farmed by lessees, or operators who do not own the land. Forty-one percent is farmed by owner/operators.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

The project area lies in an agricultural community that has not been impacted by coal mining. The small town of Dunn Center, population 170 is an old agricultural trade center that straddles the Burlington Northern railroad and is bypassed by the traffic on State Highway 200. It provides mining, farm, and ranch retail service. The town of Halliday, population 199 is similar. The chief trade and service town is Killdeer, located 9 miles west. Its population is 730. It is growing rapidly due to oil and gas activity west of the town.

The area is dryland farmed to small grain crops and that which is unsuitable for crops is used as native pasture and hay for livestock feed and provides wildlife habitat.

A few improved and unimproved roads cross the project area. The tract also contains a few miles of power and phone distribution lines that service the farm residences on or adjacent to the tract. The Burlington Northern railroad runs adjacent to the south boundary and a 41.6 KV powerline runs adjacent to State Highway 200 which is one mile south of the tract.

RECREATION

Hunting a variety of species (deer, upland game birds, waterfowl) is the main recreational opportunity offered to the public on the tract. This opportunity, while significant to local people, has limited attraction to people outside the immediate vicinity of the proposed mining.

The communities of Dunn Center and Halliday, North Dakota offer recreational opportunities in the general vicinity of the tract. Ball diamonds and parks offer adequate opportunities at this time. Lake Sakakawea, north of the tract, offers state and federal recreational opportunities.

TABLE 5
FARM/RANCH OPERATIONS - WERNER TRACT

	INSIDE COAL TRACT (ACRES)							OUTSIDE COAL TRACTS (ACRES)							
OPERATOR	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT
1	34	104	182	0	0	320	0	247	233	274	0	0	1008	1328	24
2	265	320	295	0	0	880	59	0	0	0	0	0	0	880	100
3	143	67	350	0	3	560	100	104	86	127	3	0	320	880	64
4	150	74	217	39	0	480	100	1047	825	2416	272	0	4560	5040	10
5	83	0	45	32	0	160	0	157	214	368	61	0	800	960	17
6	11	0	0	11	18	40	0	76	0	372	76	116	640	680	6
7	51	30	56	13	0	160	100	103	144	367	26	0	640	800	20
8	549	906	3315	200	0	4960	61	451	283	3509	165	0	4299	9259	54
9	193	27	18	82	0	320	0	688	473	343	256	0	1760	2080	15
10	60	0	40	60	0	120	100	274	89	445	152	0	960	1080	11
11	57	204	491	0	0	680	100	675	664	1010	0	0	2349	3029	22
12	13	0	30	4	0	47	100	515	212	494	154	0	1375	1422	3
13	724	226	490	0	0	1440	100	1282	378	1011	0	0	2672	4112	35
14	175	242	267	0	0	713	16	208	1478	510	52	0	2288	3001	24
15	79	0	78	0	0	160	100	79	0	78	79	84	320	480	33
16	129	15	16	0	0	160	0	69	107	143	1	0	320	480	33

TABLE 5
FARM/RANCH OPERATIONS - WERNER TRACT

	INSIDE COAL TRACT (ACRES)							OUTSIDE COAL TRACTS (ACRES)							
OPERATOR	SMALL GRAIN CROP	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	PERCENTAGE OF TOTAL ACRES LEASED	SMALL GRAIN	HAY	GRAZING	SUMMER FALLOW	OTHER	TOTAL	GRAND TOTAL	PERCENTAGE OF TOTAL ACRES IN TRACT
17	70	0	216	70	284	640	0	34	0	277	31	135	480	1020	63
18	0	283	197	0	0	480	0	555	2183	1803	99	0	4640	5120	11
19	62	13	85	0	0	160	0	241	202	361	0	0	804	964	17
20	293	15	12	0	0	320	100	0	0	0	0	0	0	320	100
TOTAL	3141	2526	6328	543	305	12,843	59	6906	7561	13,881	1430	335	30,113	42,956	30

AESTHETICS

The existing character of the land is largely agricultural. The appearance of the area changes through the seasons with the cropping and fallow cycle. Fields are well-defined rectangles divided by windrows, fences, shelterbelts and roads on most section lines. Interspersed variations such as small patches of broken ground, grazed prairie, and woody draws also occur. Manmade features such as a gravel pit, power lines, railroad, and agricultural structures and facilities are evident. In the region, coal mining is accepted locally as part of the land use.

The topography of the tract falls away from the main travelled way, State Highway 200, has a local relief of about 200 feet, and is observed only from minor roads in the immediate vicinity. The scenic importance of the tract is negligible.

WILDLIFE

Native prairie and agriculturally disturbed areas dominate this rolling topography with an interspersion of wetlands and limited woodlands. Spring Creek borders the area to the south, and an unnamed tributary to Spring Creek flows through the northern portions. Wetlands compose 1.6 percent of the tract; Woodlands, 1 percent; Native Prairie, 36 percent; and Agriculturally Disturbed, 61.5 percent. Essential wildlife habitat composes about 38 percent of the coal tract and non-essential farmland totals about 62 percent.

Wetlands, woodlands, and native prairie provide essential habitat for 39 wildlife species (Table 6). Whooping crane, an endangered species, migrate through the area annually.

It is the interspersion of essential habitats that has the highest value to wildlife, and the largest wildlife populations. The remnant habitats, either singly or interspersed, are the result of 60-70 years of intensive farming of most of the suitable land.

Native grasslands represent precious relics of the original prairie ecosystem. They evolved during thousands of years and once destroyed, cannot be exactly duplicated by man. The rate of native prairie loss in North Dakota has been tremendous, and unplowed prairie is only 20 percent of the original total. Wetlands, specifically prairie potholes, are the most productive wildlife habitat in North Dakota.

No sensitive fish, amphibians, or reptiles have been identified in the area.

TABLE 6
WILDLIFE HABITAT AND SPECIES

Woodlands	Wetlands	Native Prairie	Agriculturally Disturbed
*Sharptail Grouse	*Hungarian Partridge	*Sharptail	Sharptail
*Hungarian Partridge	Mourning Dove	Hungarian Partridge	Hungarian Partridge
*Mourning Dove	*Pheasant	Mourning Dove	Mourning Dove
*Pheasant	*Mallard	*Whooping Crane	Pheasant
*Merlin	*Gadwall	*Merlin	Whooping Crane
*Swainson's Hawk	*Whooping Crane	Swainson's Hawk	Swainson's Hawk
Marsh Hawk	*Pintail	Marsh Hawk	Marsh Hawk
Ferruginous Hawk	*Greenwing teal	*Burrowing Owl	Ferruginous Hawk
*Loggerhead Shrike	*Widgeon	*Ferruginous Hawk	Whitetailed Deer
*Whitetailed Deer	*Shoveler	Loggerhead Shrike	Red Fox
*Mule Deer	*Redhead	Whitetailed Deer	Badger
Mink	*Canvasback	*Mule Deer	No. Swift Fox
Beaver	*Ruddy	*Antelope	
Red Fox	*Sandhill Crane	Mink	
Badger	*Swainson's Hawk	Red Fox	
No. Swift Fox	*Marsh Hawk	*Badger	
*Bobcat	*Sprague's Pipit	*No. Swift Fox	
	*Whitetailed Deer	Bobcat	
	*Muskrat		
	*Mink		
	*Beaver		
	*Red Fox		
	Badger		

*Essential habitat for species

CULTURAL RESOURCES

Important prehistoric resources are located on the tract. Ten percent of the tract and twenty-seven percent of the surface over federal coal have been the subject of an intensive cultural resource survey. Sites ranging from the large and complex Knife River flint quarries, through habitation sites, to open plains sites that are task specific and exploitative in nature, have been recorded. These include bison kill sites; lithic scatters of varying size, density, and function; and seasonal and long-term habitation sites.

The clustering of important sites involving 1,560 acres in the southern portion of the tract has been determined to be unsuitable for mining. These areas are grouped along Spring Creek and may reflect a relationship between the location of water and raw lithic material that governed prehistoric human activity in the area.

The dominant human use of the area in the historic period has been farming. Stock raising has been a minor use. Most evidence of historic activity is oriented toward farming activity. This activity, which continues to the present time, has possibly eradicated cultural resources from earlier times.

ECONOMIC AND SOCIAL CONDITIONS

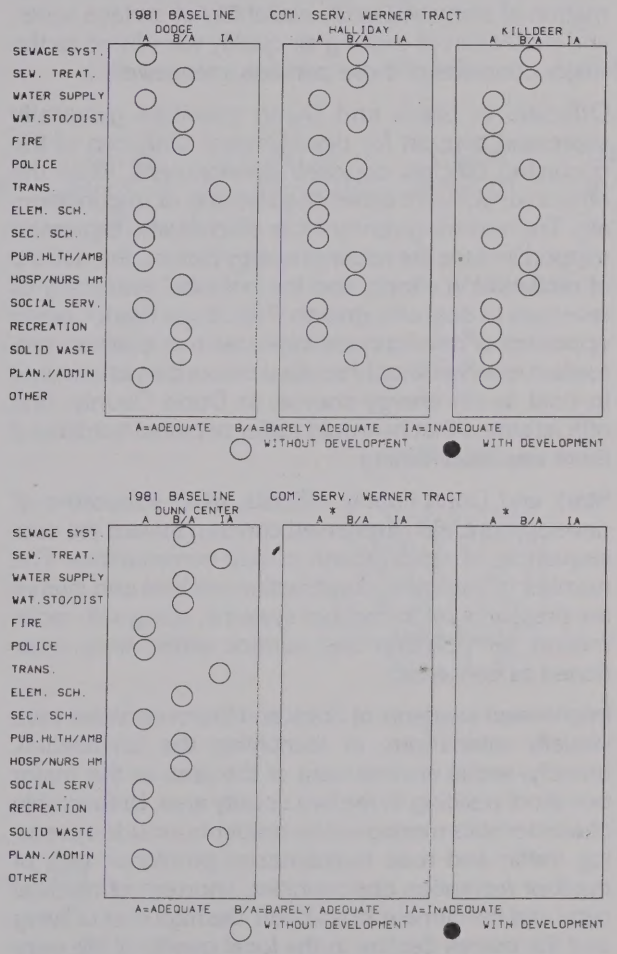
Existing and forecasted population and employment levels for the communities of Dodge, Dunn Center, Halliday, and Killdeer are shown in Figure 3, Chapter 3 (Mountain West 1981). As this figure shows, future population levels without the leasing of federal coal (refer to dashed line) for Dodge, Dunn Center, and Halliday are expected to increase until the late 1980's and early 1990's and then gradually decrease through 2000. Future population levels in Killdeer, without energy development, are expected to increase from 1981 though 2000.

These communities are small agriculturally oriented towns. Almost all have received some growth in the last three to five years due to oil and gas or coal development. As Figure 1 shows, all of the communities except Killdeer presently (1981) have one or more public services considered to be inadequate. For example, Dunn Center currently has inadequate sewage treatment for its present population.

The adequacy ratings appearing in Figure 1 reflect assessments by regional planners, county planning commissions, and town councils. It should be recognized that some assessments were based on best judgment and are somewhat subjective.

Twenty-four Stark County residents were contacted by a BLM survey. Among other things, the people were asked to identify which locally provided services and facilities were most problematic for them. The most frequently mentioned service problem in Stark County was law enforcement. Apparently recent growth attached to oil and gas development in the area led to a perceived need for additional law enforcement personnel and equipment. Contacts with eleven Dunn County residents resulted in only roads, medical care, and day care for children being identified as significant service-facility problems at this time.

FIGURE 1



SOURCE: Respective city/county or regional planners.

Less than one-half of Stark County residents interviewed unconditionally supported expanded mining activity in the area. Together with those persons who supported development, but attached qualification to that support, a slight majority of Stark County residents considered themselves supporters of coal mining expansion. However, roughly one-third of the persons interviewed identified themselves as opponents of coal mining, either conditionally or unconditionally. Therefore, unlike other counties in the region, the pattern of support and opposition to mining in Stark County is quite diverse. In contrast, only a single person interviewed in Dunn County was opposed to local coal

mining. Other persons were strongly supportive, with minimal qualifications.

Persons in both Dunn and Stark who favored development, tended to do so because they believe that there is a national need for more energy production and that reclamation will be successful. Persons who opposed development, particularly in Stark County, expressed skepticism toward reclamation efforts and indicated that local landowners might not be treated fairly by energy companies. For both opponents and supporters of area mining, the concerns were similar. Reclamation of disturbed land, availability of surface water, and protection of existing air quality were listed as the major concerns of those persons interviewed.

Officials in Stark and Dunn counties generally expressed support for development. Only two of the contacted officials opposed development, while the others supported it either conditionally or unconditionally. The reasons given by those officials who expressed support include the national energy picture, the viability of reclamation efforts, and the potential availability of revenues to deal with growth. The single Stark County opponent of development indicated that available petroleum reserves should be used before the nation turns to coal as an energy source. In Dunn County, one official stated that he would suffer personal hardship if there was local mining.

Stark and Dunn county officials, while supportive of development, also expressed concern toward the consequences of rapid growth in their communities. The number of incoming construction workers and attendant pressures on the school systems, along with reclamation, air pollution and surface water, were mentioned as concerns.

Interviewed residents of Stark and Dunn counties were virtually unanimous in identifying the uncrowded, friendly, social environment of the area as the major benefit of residing in the two county area. Unfavorable characteristics mentioned by residents include increasing traffic and road maintenance problems, lack of outdoor recreation opportunities, shortage of medical care, and the climate. In addition, the high cost of living and the overall decline in the local quality of life were brought to the attention of BLM interviewers as negative aspects of life in Stark County.

CLIMATE AND AIR QUALITY

The climate of western North Dakota is typically continental, characterized by variable temperature and precipitation. The predominant pressure systems, out of the Gulf of Mexico and the Arctic, account for the rapid alterations of meteorological conditions common to the area. Cold polar air masses dominate the winter months, while moist Gulf air masses prevail in the spring and summer, distributing the major precipitation across the area.

Meteorological data available from surrounding stations are shown in Tables 7 and 8. The Werner tract is located northeast of the meteorological station, southwest of Dunn Center, and within the National Weather Service (NWS) West Central Region. The meteorological station at Wibaux will be used to establish benchmark climatology for the tract.

TABLE 8
REPRESENTATIVE REGIONAL METEOROLOGICAL DATA

	Regional Values
Humidity (Annual Average), %	40-50
Lake Evaporation (Annual Avg.), in.	50-55
Extreme Weather	
Thunderstorms, days/year	30
Tornadoes, sightings/year	rare
Hail, days/year	2-4
Maximum recorded wind speed, mph*	72
Inversion Frequency (base 1500 ft.), %	
Annual	35
Seasonal Range	30-50
Mixing Height, ft.	
Mean Annual Morning	984-1312
Mean Annual Afternoon	4921-5249
Mean Seasonal Afternoon Range	1968-7874

*Recorded at Bismarck, North Dakota

Sources:
Brum, L.J., J.W. Enz and J.M. Ramirez 1978.
Jensen, R.E. 1974.
Ramirez, J.M. and T. Method 1976.
U.S. Department of Commerce 1974.

The annual mean temperature for the area is 40.2°F with a highest monthly mean temperature of 68.7°F (in July), and a lowest monthly mean temperature of 7.9°F (in January). The average growing season is approximately 122 days; the last spring freeze generally occurs during the third week of May, while the first fall freeze generally occurs during the third week of September (Ramirez, J.M. and T. Method 1976).

Precipitation in the area occurs predominately in the late spring and early summer (May to July). Annual precipitation averages 14.19 inches at Wibaux, and 16.92 inches at Dunn Center and 16.91 inches through the NWS West Central Region. The average annual snowfall at the Wibaux station is 33.7 inches.

Wind data used for this analysis were obtained from the Dickinson climatological station, the nearest station to the tract with data suitable for input into the dispersion model. The wind rose in Figure 2 represents a summary of this data. Winds prevail from the W to NW at Dickinson (34 percent frequency of occurrence). Wind speeds average 13.7 mph and exceed 11.5 mph 54 percent of the time.

Although the terrain offers only limited obstruction to the dispersion of pollutants, the area experiences frequent temperature inversions, which reduce mixing heights and tend to concentrate pollutants (Brum, Enz and Ramirez 1978).

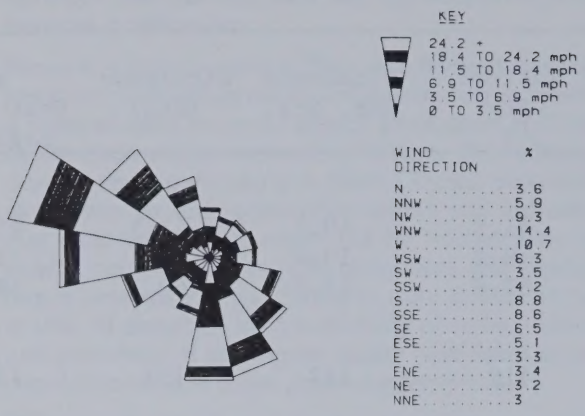
TABLE 7
METEOROLOGICAL DATA FOR SELECTED SITES

Parameter	Dunn Center	Fairfield	Watford City 14S	Dickinson Exp. Sta.	Dickinson (FAA)	NWS West Central Region
Temperature, °F						
$\bar{X}$ annual, °F	40.2	42	41.8	40.5	41.5	42.0
$\bar{X}$ monthly low (Jan)	9.2	12	9.9	10.4	12.1	12.8
$\bar{X}$ monthly high (July)	68.6	71	62.8	68.5	69.3	69.6
Growing season for grass (temp. 32° F), days	122	133	119	117	133	129
Precipitation, in.						
Annual average	16.96	16.45	16.27	16.56	15.58	16.20
Monthly range	0.34-4.32	.27-4.00	.46-3.74	.30-4.01	.30-4.01	.34-3.97
Annual snowfall	33/7	34	36	32	34	30
Annual stability, (by class)						
% occurrence						
Class A, B, C					8.9	
Class D					69.9	
Class E, F					21.2	
Wind direction, (%)					W-NW(34)	
Wind speed, mph (% of time)					0-3.5 (4) 3.6-6.9 (13.4) 7-11.5 (30.5) 11.6-18.4 (39.1) 18.5-24 (11.3) >24 (1.6)	
Average wind speed, mph					13.7	

*SOURCES:

Jensen, R. E. 1972.
North Dakota Crop & Livestock Reporting Service 1980.
Ramirez, J. M. and T. Method 1976.
Ramirez, J. M. 1972.
Ramirez, J. M. 1973.
U.S. Department of Commerce 1948-1974; 1973; 1974; 1979.

FIGURE 2



WIND ROSE FOR DICKINSON NORTH DAKOTA

Table 9 presents some of the available air monitoring data from ambient air monitoring stations in the general vicinity. Recorded annual geometric mean concentrations for total suspended particulates (TSP) from area rural locations have ranged from 11 ug/m^3 (at Medora) to 29 ug/m^3 (at Dickinson). From 1971 to 1980, the annual geometric mean concentration of TSP at the Dickinson commercial monitoring station ranged from 36 to 77 ug/m^3. For the purpose of the following computer analyses, the background rural TSP levels will be set at 22 ug/m^3 for the annual level and 80 ug/m^3 for the 24-hour level.

Three Class I areas, the North and South Units of Theodore Roosevelt National Park and the Lostwoods National Wilderness Area, fall within the potential impact range of the proposed tract and associated developments. Based on 1979 air quality computer modeling estimates by the North Dakota State Department of Health, the allotted 24-hour SO_2 increment for the South Unit of the Park is consumed, or nearly consumed. Visibility was observed to range from 73 to 96 miles at the Theodore Roosevelt National Park during 1979 (John Muir Institute 1980).

TABLE 9
WEST CENTRAL NORTH DAKOTA AIR MONITORING DATA*

Monitoring Site	Year	Parameter	No. Observations	Max. Observation (ug/m^3)	2nd Max. Observation (ug/m^3)	Annual Geom. Mean (ug/m^3)	Annual Arith. Mean (ug/m^3)
			State-Operated Sites:				
Dunn Center	79	TSP	4	37	17	16	19
		SO_2	1896	78	26	13	13
	80	TSP	33	58	52	22	25
		SO_2	7332	52	39	<5	<5
Halliday	76	TSP	13	55	27	18	21
	77	TSP	56	189	117	19	28
	78	TSP	33	47	42	14	16
Mandaree	76	TSP	10	61	42	23	28
	77	TSP	44	78	68	24	29
	78	TSP	54	108	91	19	24
	79	TSP	50	63	59	21	24
	80	TSP	50	95	83	27	31
TRNP-N	79	TSP	44	59	53	14	20
Watford City	80	TSP	53	534	83	20	32
(rural)		SO_2	1432	133	110	<5	<5
Grassy	76	TSP	14	49	40	13	17
Butte	77	TSP	52	126	79	19	26
	78	TSP	34	81	47	14	18
TRNP-S	74	TSP	19	88	45	11	19
Medora	75	TSP	49	72	50	13	18
(rural)	76	TSP	43	120	46	16	22
	77	TSP	49	118	115	16	23
	78	TSP	51	95	84	13	18
	79	TSP	51	48	40	14	17
	80	TSP	55	1313	442	21	54
		SO_2	7597	60	50	<5	<5
Dickinson	76	TSP	59	76	64	26	32
(rural)	77	TSP	55	421	192	26	41
	78	TSP	54	162	97	21	29
	79	TSP	30	96	96	21	28
			Privately-Operated Impact Source Monitoring Sites:				
Western Gas Fairfield	80	SO_2	2601	865	512	<5	13

*SOURCE - North Dakota State Department of Health

CHAPTER III
ENVIRONMENTAL CONSEQUENCES

TOPOGRAPHY

The natural contour would be modified during surface mining. Although most land would be returned to its approximate original contour, difference in detail would remain, including drainage patterns and final sloped highwalls.

In general, the reshaped ground would not be steep enough to cause slope failures and related hazards. Until natural vegetation can be reestablished, accelerated erosion which produces unsightly scars on the land, would be a potential problem.

GEOLOGY AND MINERALS

Mineral resource conflicts might occur between development of oil and gas and mining coal since there is some potential for finding oil and gas on the tract.

SOILS AND RECLAMATION POTENTIAL

The types of impacts affecting the soil resource in this area have previously been discussed in Bureau of Land Management planning documents and the Draft West-Central North Dakota Regional Environmental Impact Study. Briefly, the basic impacts are the disruption of the present soil bodies with temporary loss of productivity, in addition to problems associated with erosion, compaction, and instability.

Soil erosion and compaction problems would not be new to the area because of the dryland agricultural activity that presently exists. About 25 percent of the tract is annually cropped with 4 percent left bare of protective cover during summer-fallowing. Therefore, these types of impacts would continue with or without the presence of an active mine.

Some instability problems would appear with the onset of reclamation. Area-wide settling, localized subsidence or collapse, and underground erosion called piping may occur (Groenwald, 1980). If the required stipulations covering the handling of soils and overburden during surface mining operations are closely adhered to and enforced, however, instability impacts should be minimal.

The soils would be lost for the production of grass, forage, and grain over the short-term use, about 10 years for each annual disturbance of 321 acres. This loss would occur only on the active portion of the mine at any given time. Once in full operation, the total tract area out of production in any peak mining year is estimated to be 3,200 acres. Soil would be continuously replaced on mined-out areas and brought back into production during the life of the mine, approximately 40 years.

Preliminary indications, from completed and ongoing research by such agencies as the Science and Education Administration—Agricultural Research of Mandan, North Dakota and North Dakota State University—Agricultural Experiment Station of Fargo, are that agricultural productivity of mined land can be restored. Much depends, however, on the planning and implementation of a concerted reclamation effort (Power 1974).

With a good reclamation effort, successful return of agricultural productivity over the tract should be possible. Soils Table 2 in Chapter II indicates that most landowners have sufficient acreage of soil rated "good" and "fair" for supplying cover soil material in surface mine reclamation. However, there are four separate parcels that have nearly half or more of their acreage rated "poor." These may require a very intensive reclamation effort to ensure successful rehabilitation. Often a thin layer of topsoil can be salvaged from the "poor" soils. If better soils exist in the parcel of land, they can provide extra material to average over the area. Several core drill holes in the Dunn Center tract, south of the Werner tract, indicate that the top portion of some of the overburden is suitable for use near the surface of reconstructed soil profiles. If enough suitable plant growth material from the above mentioned sources can be averaged over parcels with soils rated "poor," it should be possible to increase their productivity.

HYDROLOGY

During mining, all the surface runoff from the disturbed area must be impounded and not released until it meets specified quality standards. An exception to this is when storm runoff exceeds the design capacity of the reservoir. Water that collects in open mine pits is also often pumped into these surface water reservoirs. While these runoff catchment basins are in place, total water yields would be decreased due to increased evaporation and infiltration at the reservoirs. Table 10 shows the maximum possible loss of water yield for the watersheds draining this tract, assuming no surface water is released. The impact on local streams may be significant.

TABLE 10
MAXIMUM LOSS OF WATER YIELD FROM THE WERNER TRACT

Watershed	Area to be Disturbed (acres)	% Watershed to be Disturbed	Maximum Water Yield Reduction (acre feet/yr)	% Reduction in Flow
North Creek	5,764	20.8	480	20.8
Unnamed Creek	1,273	6.1	106	6.1
Direct Trib. Spring Creek	7,235	85.0	603	85.0
Spring Creek near Halliday	14,272	8.6	1,193	8.6

Water which is released from the impoundments would generally have less suspended solids, higher dissolved solids, and higher sodium adsorption ratios. At this time it is impossible to predict exactly how much difference there would be in these water quality constituents.

Flooding of Spring Creek, while digging or stockpiling soil or overburden within the 100-year flood recurrence zone, would significantly degrade the quality of water. This impact could be mitigated by avoiding disturbances and stockpiling within this flood zone, and building properly designed road crossings.

The A and DC lignite beds, as well as sand beds in the overburden and interburden, are aquifers. During mining the lignite would be removed and the sand beds destroyed during overburden handling. While the pits are open, water levels in the disrupted lignite and sand beds would be drawn down in the area surrounding an open pit. The lignite is missing from beneath the buried channels, but drawdowns can be expected in these channel aquifers while open pits are located adjacent to them. The distance that this drawdown would occur from an open pit varies across the tract. It is dependent upon the local aquifer characteristics and upon how far the bottom of the pit is located below the water level. This impact would affect between 25 and 35 water wells used for domestic and livestock purposes.

The flow patterr of groundwater through the area would also be disrupted. The open pit would act as a groundwater sink. During mining this effect limits all groundwater quantity and quality impacts to the area included within this cone of depression around the open pit. Water levels over the entire tract and adjacent areas would not change everywhere at once. It would progress as mining moves across the tract.

Once the overburden is replaced in the pit, the drawdown stress would begin to subside and approach a postmining equilibrium. The flow patterns of groundwater would still be different than under premining conditions. Generally water would not be as available from the replaced overburden under postmining conditions.

The physical disturbance caused by a mining action would also result in changes in the chemical quality of the local groundwater. Increases in sodium, sulfates, and total dissolved solids concentrations have been reported by Groenewold (1979 and 1980) at other mines in North Dakota with similar overburden. These changes in water quality were variable but dependent upon overburden characteristics and reclamation practices. The quality of water in the replaced overburden and lignite down gradient would be similarly degraded. As water moved through the system away from the mined area, it would be diluted by relatively fresh recharge water from unmined areas. Studies to date have not found altered water quality further than about one or two miles away from mined areas. It is not known exactly what the extent of this impact would be in the long term.

Any wells finished in the mined area below the Dunn Center lignite would be physically destroyed but their water source would not be significantly altered. Wells finished in or above the Dunn Center lignite within the tract would have their water source degraded if not destroyed. Wells finished in the A or DC lignite in the area surrounding the tract could have their water source degraded. There would be between 14 and 20 water wells impacted over the life of the mine. These wells are used for domestic and stockwater supplies. Water of similar quality and quantity is available at deeper depths. Associated with these deeper replacement wells would be higher operating and maintenance costs to the local water users. Also any additional wells needed in the future after the mining company has fulfilled its replacement obligations and left the area, would cost more to drill. The cost of these additional wells would not be paid by the mining company.

During low flow periods, the source of discharge through Spring Creek is the shallow lignite and sand aquifer system. Mining next to the stream would cause degradation of water quality in the creek. In order to avoid degradation of water quality in Spring Creek, a buffer zone with no mining would have to be established. It would depend upon the local aquifer characteristics and on the quality of the groundwater moving through the spoils. The former has not been inventoried in enough detail, and the latter process is difficult to project.

This impact has implications for a couple of water use related values. Spring Creek water quality during low flow currently equals or exceeds the limitations for sulfate, percent sodium, and total dissolved solids set by the North Dakota State Health Department. Any degradation to Spring Creek would cause a violation of the standards.

Spring Creek has been determined to have potential for being an Alluvial Valley Floor. A final determination has not been made due to a lack of detailed data. This determination would be made at the mine permit stage.

VEGETATION AND AGRICULTURAL PRODUCTION

The proposed action would progressively remove an average of 321 acres of the total tract per year from its current uses. The major use is agricultural production. The time period of removal from agricultural production would be the time spent in mining and land reclamation. The entire tract would be progressively mined over a 40 year period.

Mining of any one location would be the land use for one to five years depending on the type of mining. Land reconstruction to premining levels of agricultural production would require a total of approximately ten years. The land would be placed into the premining type of agricultural production or other premining uses that the landowner and Public Service Commission agree upon (wildlife habitat, woodlands, or rights-of-way). Vegetation reestablishment would begin during the first appropriate season after grading to contour and replacing of topsoil.

The company would be under bond for as long as necessary to prove that agricultural productive capacity had been restored to equal or better than it was before mining, at a 90 percent confidence level (Public Service Commission, Reclamation Department 1980). Reclamation research, by such agencies as the Science Education Administration—Agricultural Research Service and the North Dakota State University—Agricultural Experiment Station, indicates that some degree of optimism for the restoration of land to agricultural production is justified, although there is no certainty as to how long it would be before all mined land would be judged as fully restored as the law requires.

The leasing and development alternative would have a significant short-term impact on individual agricultural operations in the tract. By the end of the 40-year mine life, 12,843 acres of the tract would be disturbed in addition to 160 surface acres used for existing mine facilities.

An average of 87 acres of cropland, excluding summer fallow, would be removed from production each year. This would be an average annual loss of 2,227 bushels of wheat. This 87 acres of cropland would be out of production ten years with a maximum of 861 acres out of production in any one peak mining year, resulting in a maximum loss of 22,042 bushels of wheat annually.

Peak mining years disturbance of 632 acres of non-cropped hayland would result in an annual loss of 822 tons of hay production.

An average of 157 acres of rangeland would also be removed from production each year, resulting in an average loss of 79 AUMs. This 157 acres of rangeland would be out of production ten years with a maximum of 1,582 acres out of production in any one peak mining year, resulting in a maximum annual loss of 790 AUMs.

Regionally, these losses would not pose significant reductions in area agricultural production.

Time constraints necessitated BLM doing agricultural data collection on the preliminary logical mining unit instead of the later final logical mining unit. The data may not completely represent the logical mining unit in its final form.

In reestablishing native-type range, it is likely that some introduced species would be used. The laws require that introduced species be of the same seasonal variety and of equal or superior utility to the native species. Some of the more sensitive plants (for cropland, woodland, or rangeland use) may have difficulty in becoming established on some of the less suitable soils.

Forbs, woody plants, and trees (woodlands) must be reestablished along with grasses.

AGRICULTURAL ECONOMICS

This section will be forthcoming under separate cover.

LAND USE

Existing land use would be changed within the project area and additional land would be used in nearby communities to accommodate new residences, services and facilities resulting from population increases. The displaced land use would be agricultural in both instances, but provisions of the law require reclamation of the temporary changes in the tract. Displacement of use for urban expansion may be considered a permanent change.

Displacement of existing use using progressive mining would be up to ten years for any given location that would be mined. Longer time periods would be involved with some haul roads and with the mine office and associated facilities.

RECREATION

Habitat destruction and the resulting loss of wildlife species (deer, upland game birds, waterfowl) would damage recreational hunting. From the recreation perspective, it is likely the loss would be manageable.

Social and economic studies have documented

demographic changes resulting from mining that would stress communities in the vicinity of the tract. This stress would be felt on the available recreation facilities in the communities. Outside of the communities, increased pressure would occur on private and public land because of recreational opportunities lost to mining.

AESTHETICS

Coal development on the Werner tract would have a negligible effect on scenery through the area because development would be below the normal line of sight from major roadways.

Aesthetically, coal mining activities may not be pleasing, but are considered part of the fabric of the land use pattern of this region.

WILDLIFE

Coal mining and attendant actions would severely disrupt and destroy locally significant wetlands interspersed with native prairie, which singly and in composite constitute the essential habitats for 32 wildlife species (Map 3, Chapter I).

On-site effects to wildlife resources would be degradation and loss of essential habitats. Offsite aquatic habitats in Spring Creek, and the Knife and Missouri Rivers, would be recipients of potential point and non-point pollution.

The agriculturally disturbed areas are of low wildlife habitat value, but do provide spring and fall feeding and loafing habitat for migratory waterfowl and shorebirds.

The areas on Map 3 (Chapter I) are those which represent the highest value sensitive wildlife habitats.

There would be a significant area loss to wildlife resources if strip mining occurs in the essential wetlands, woodlands, and native prairie and they are not replaced in full or are converted to farmland.

Mobile wildlife such as birds and large mammals may shift about the habitat losses to some degree, but non-mobile species such as reptiles and amphibians would be destroyed. The very limited availability and disruption of riparian woodlands and wetlands would restrict, and in many cases exclude, the accommodation of disturbed mobile wildlife.

Noise, presence of humans, heavy equipment, dust and affiliated disturbances cumulatively may cause wildlife to vacate unmined habitats and may preclude adoption by wildlife of those rehabilitated areas until the disturbances are eliminated. This would be for the life of the mine and rehabilitation period, which could be as long as 20 or more years.

Increased human populations, resultant of mine development and operations, generally reduce wildlife populations and habitat locally and off-site by poaching, road kills, increased legal harvest, disturbance during reproductive and migratory periods and habitats, harassment by recreationists, feral and uncontrolled cats and dogs, and degradation and complete loss of habitat due to housing, shopping centers, waste treatment plants, and similiar urban development. The problem is compounded in areas where shift changes of workers coincide with feeding periods, especially big game. The same would probably occur in this area.

Actions to mitigate these impacts, available to entities other than BLM, would be to provide mass transportation of workers and adjust the time of shift changes, which would greatly reduce poaching. This has been used successfully in other mining areas. Providing funds for the North Dakota Game and Fish Department for increased law enforcement or adoption of a poaching clause in union contracts would also help.

Successful reclamation of native woodlands and natural wetlands such as "potholes" and riverine wetlands has not been demonstrated. Native prairie has not been successfully re-created, either, although some prairie plowed about 70 years ago and since left undisturbed shows some evidence of native plant species reestablishment.

Concurrent reclamation of lost wildlife habitat within 12 to 18 months after mining may reduce a few of the less negative wildlife impacts. However, disruption or loss of any of the larger wetlands and riparian woodlands is expected to become a permanent loss.

At present there is no information to suggest that natural, biologically viable wetlands, such as potholes, can be reclaimed from mine spoil in this country. It would be most productive and conservative to eliminate mining from the larger wetlands of one-half acre and greater, thereby retaining the critical soils structure of the wetlands and eliminating the extended delay proposed for wetlands reclamation attempts. Destruction of natural viable wetlands by strip mining under the present state of biological and hydrological knowledge would be an irretrievable commitment of wildlife resources.

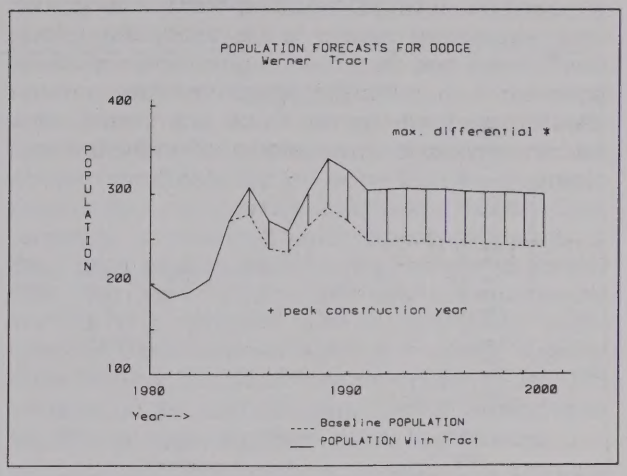
An interagency team of wildlife biologists from the North Dakota Game and Fish Department, U.S. Fish and Wildlife Service and Bureau of Land Management have identified and recommended areas for the application of unsuitability criteria (Map 3, Chapter I). Formal recommendations have been received by BLM from the other agencies. Joint agreement among the agencies and final decisions on unsuitability, exemptions such as producing leases, and exceptions will be completed in August 1981.

CULTURAL RESOURCES

All cultural resources within the tract boundary are subject to direct and indirect impacts. Direct impacts are those that result from ground disturbance activities and can result in damage and destruction to sites, artifacts, their environmental context and the data they contain.

Sites not directly impacted by earth disturbance may receive secondary impacts such as vandalism, and loss as a result of erosion.

Lease stipulations to treat both recorded and unrecorded sites would require management plans for cultural resources and detailed mitigation plans.



ECONOMIC AND SOCIAL CONDITIONS

Construction and operation of the Werner mine would result in significant impacts upon services in some communities within the area as a result of population growth associated with employment opportunities. Figure 3 shows forecasted community employment and population levels through the year 2000 both with and without development of the Werner tract. As this figure shows, Dodge, Dunn Center, Halliday, and Killdeer would experience a significant increase in both population and employment as the result of the development of the tract.

Several other communities in western North Dakota would also receive population increases as a result of tract development. However, assessments by BLM as well as city-county and regional planners show that these population increases are so small (often less than one percent of the baseline population) that they would not significantly affect community service adequacy.

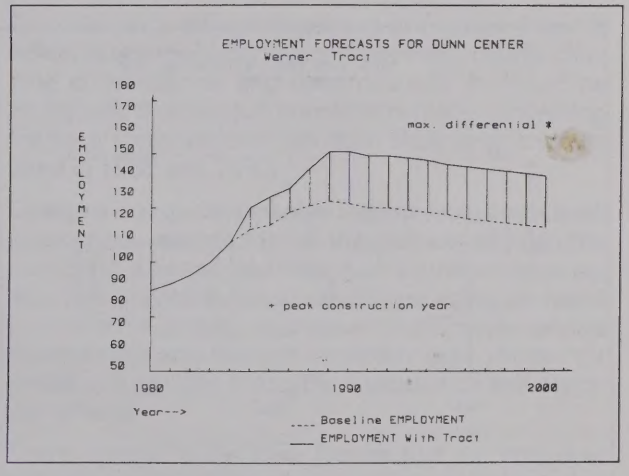
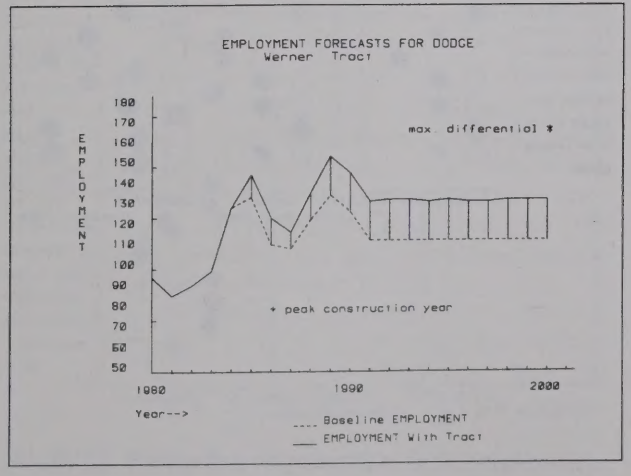
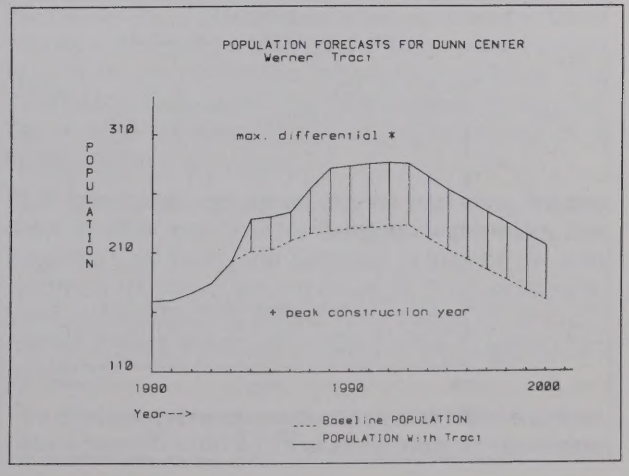


FIGURE 3





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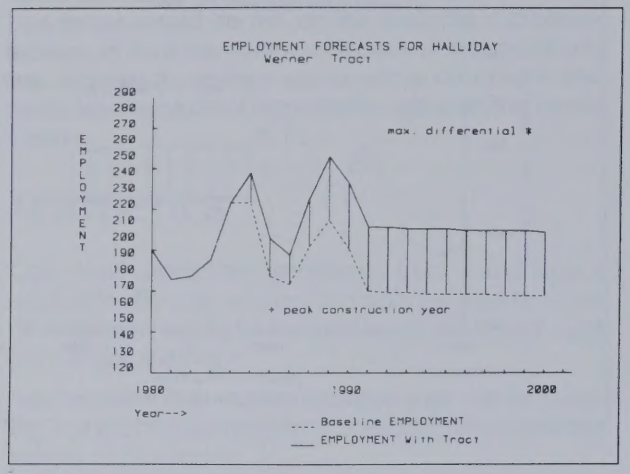
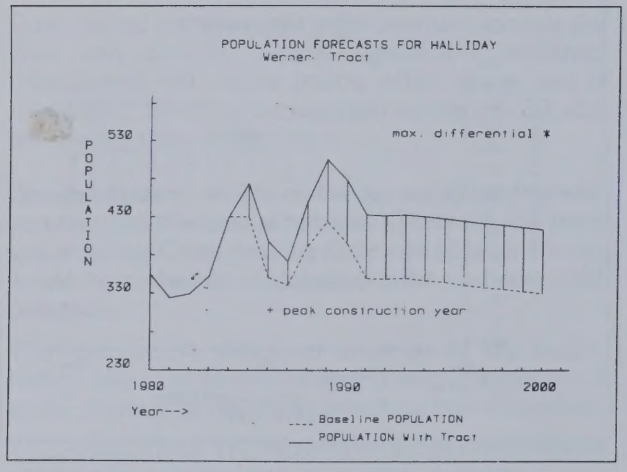
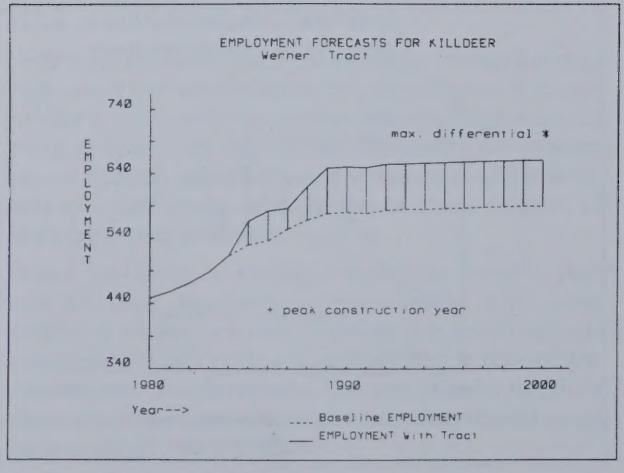
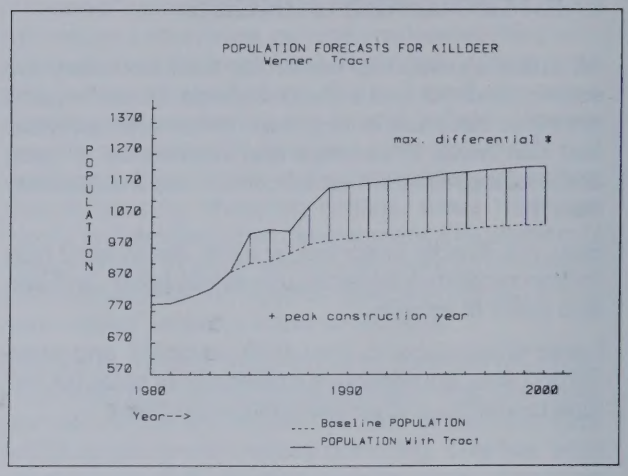




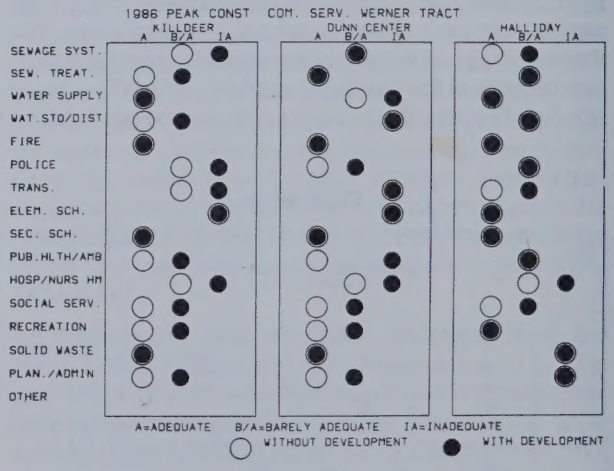




SOURCE: Mountain West Research, Inc., 1981.

Peak employment during the construction phase of the Werner mine is expected to occur in 1986 at 205 employees, with full operations employment expected in 1990 at 290 employees. Using these two years as primary impact dates, it is estimated that the communities of Dodge, Dunn Center, Halliday, and Killdeer would experience an inadequate level of one or more community services as a direct result of the 1986 peak construction employment/population levels associated with construction of the mine (Figure 4). Some services, such as solid waste disposal in Halliday would be inadequate by 1986 without tract development. Tract-related population influx would further exacerbate an inadequate service situation.

FIGURE 4



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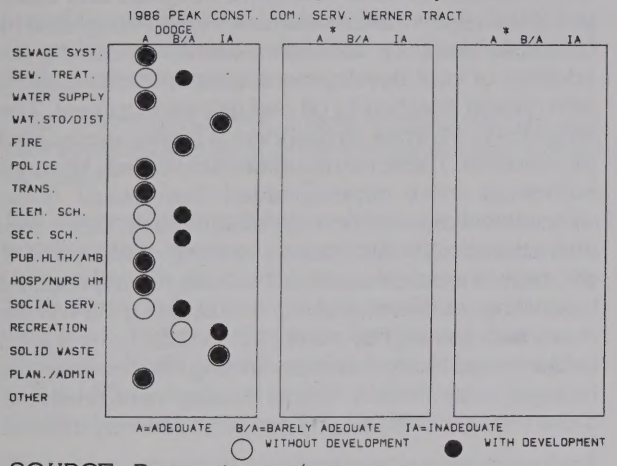
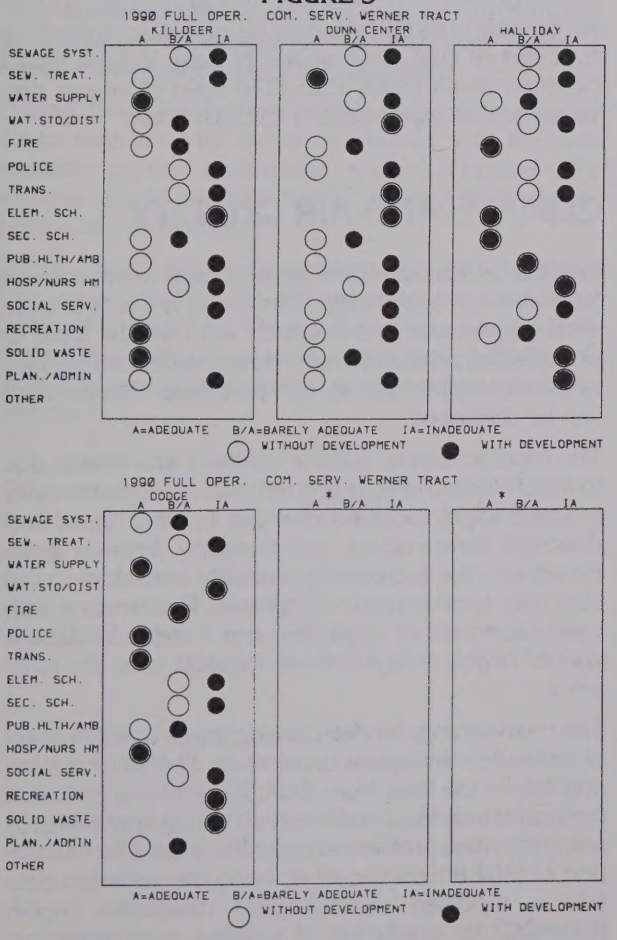


SOURCE: Respective city/county or regional planners.

Full operation (i.e., 1990) of the Werner mine is also expected to result in serious impacts on area communities. Figure 5 shows that Dodge, Dunn Center, Halliday, and Killdeer would all have public services which would be inadequate as a direct result of the population influx associated with mining operations.

FIGURE 5



SOURCE: Respective city/county or regional planners.

Several of the services appearing in the community service groupings are of greater importance than others in maintaining public health and safety. Basic services such as sewage collection and treatment, water supply and water storage/distribution, health care and police/fire protection are of more immediate concern to community well-being than are non-basic services such as recreation facilities and libraries. Consequently, communities which experience impacts to these basic services would undergo somewhat greater difficulties than would a community which experiences impacts on its non-basic services. Additionally, inadequacy of basic services (water and sewage systems especially) can be difficult for a community to deal with because of the relatively large capital expenditures required for upgrading these plants and services.

The rural areas of Dunn County would also receive tract related population influx (though at a much lower level than the communities). This population growth would result in additional demands on some services listed in Figures 4 and 5.

The adequacy ratings appearing in Figures 4 and 5 reflect assessments by regional planners, county planning commissions, and town councils. It should be recognized that best judgments were made concerning the fiscal (revenue/cost) situation likely to be encountered in 1986 and 1990.

Changes in regional personal income from tract development are expected to be insignificant through the year 2000. The communities in which the workers and their families reside would experience some increases in economic activity as a result of employee payroll expenditures and through company expenditures for goods and services during the construction and operation phases.

There appear to be three factors that are critical in mitigating many of the adverse economic impacts due to coal related population growth. One factor is that the community needs adequate lead time to prepare for the increased population before the major population influx occurs. The second crucial mitigation factor is the availability of planning expertise to assist the community in designing and implementing a planning strategy to accommodate the increased population. The third factor is adequate financial assistance to carry out the needed community service improvements in a timely manner.

BLM can make recommendations regarding leasing dates to allow lead time for community planning. The Regional Coal Team and Secretary of Interior can also recommend certain leasing dates. BLM recommendations on leasing dates will be made during the environmental impact statement phase after tract ranking has occurred.

The affected counties and communities may be able to obtain planning and financial assistance through state

agencies such as the North Dakota Energy Impact Office and federal agencies such as the Farmers Home Administration and Department of Housing and Urban Development. At this time, it is not known if the impacted communities will actually be able to acquire the needed planning and financial assistance. This is dependent upon Congressional budgeting action and total demand for energy impact assistance.

There are areas in North Dakota other than Stark and Dunn counties that would be affected by construction and operation of the Werner mine; included are Burleigh and Morton counties (the cities of Mandan and Bismarck) and Williams County (Williston). Particularly in Bismarck and Mandan there would be some growth attributable to opening the Werner mine.

However, Bismarck, Mandan, and Williston, are quite large in population relative to other communities in the area. The Werner mine induced growth would be, for both the construction and operation phases, less than a 1 percent increase over baseline population levels. In these cities population growth of this magnitude would not result in a social environment noticeably different than from the one that would exist without development. The changes would be insignificant.

In Stark County, another location where Werner-induced growth would occur, the anticipated changes in social structure are somewhat different, but remain limited in overall effect. At peak construction Dickinson would be expected to have roughly 450 to 500 more persons than without development, and Belfield would have roughly 50 more persons. In both cases the difference between this population level and the baseline population level is about 2 to 3 percent. This would, at least temporarily, be noticeable as traffic, pressure on services, crowding and similar effects took place. However, for both the short-term and long-term (operational phase) this level of population change should not affect the social structural characteristics of Stark County or communities in the county.

In Dunn County, roughly three hundred persons above baseline would be expected at peak construction, with this increasing to about 500-600 during the operation phase. These numbers are substantial in Dunn County and the communities of Dunn Center, Halliday, Killdeer, Manning and Dodge. Dunn communities have low, generally homogenous populations and there has been limited historical industrial activity. Therefore, it should be expected that the opening of a Werner mine would alter the social character of the area. Along with oil and gas development, coal mining would mean a shift away from the traditional economic base, agriculture. Some adaptations (through the family, political, leisure, and occupational institutions) would occur and it is not likely that chaotic conditions would be evident. In short, the Werner mine would result in Dunn County's social life being altered, but not profoundly.

While Werner mine would not have profound structural implications for persons living in Stark and Dunn Counties, it is likely that attributes now widely recognized as favorable would be somewhat further eroded by the addition of coal development induced growth, along with growth attached to oil and gas development. The small town, informal atmosphere is highly appreciated by residents. These communities would likely become somewhat more depersonalized than would occur without coal development. Simultaneously, those area characteristics (traffic, roads, presence of newcomers, shortage of medical care, etc.) that are not appreciated by existing residents would, due to opening the Werner mine, become slightly more problematic for residents in Dunn and Stark counties. Sorting out the changes brought on by this level of coal development, relative to those brought on by oil and gas, would be very difficult.

Technical reports are available in the Montana BLM State Office which discuss the methodology used in the economic and social analysis.

NET ENERGY ANALYSIS

A net energy analysis was calculated using the guidance contained in BLM Washington Office Information Memo 80-640, July 17, 1980. Approximately 37.7 British thermal units (Btus) would be expended to produce a pound of coal. That pound of coal, in turn, would produce about 6,600 Btus. The ratio of energy produced to that expended is 175 Btus/1Btu.

CLIMATE AND AIR QUALITY

Impacts on climate from the proposed action cannot be addressed specifically. This is due to a lack of technical information and research work on the topic of potential impacts on climate. However, general climatic influences applicable to the proposed development can be discussed.

The modification of surface contours and albedo due to redistribution of soils and removal of vegetation may produce slight localized changes in wind speed and direction, temperature, and humidity. Impacts associated with the increased particulate emissions could also alter local climatic conditions. Reclamation with reestablishment of vegetation and a stable landscape should largely mitigate these impacts over the long-term.

The methodology for determining the air quality impact of particulate emissions consists of: 1) obtaining mine profiles for the tract from BLM; 2) obtaining emission factors for individual surface coal mining operations; 3) using the mine profile and emission factors for calculation of total emissions; 4) entering the emission data into a modified climatological dispersion model (CDMQC) for prediction of ambient concentrations; and 5) comparing predicted concentrations to Federal

and State Ambient Air Quality Standards and to Prevention of Significant Deterioration (PSD) increments. The air quality impact was analyzed for the proposed tract's peak production period.

Details about the CDMQC model, emission factors, and their application appear in the technical report (separate cover).

The results of the modeling analysis were plotted on an isopleth map. The predicted concentrations were then compared with applicable air quality standards. The 1970 Clean Air Act Amendments establish primary and secondary National Ambient Air Quality Standards (NAAQS). North Dakota established air quality standards in 1969. The present Federal and State ambient air quality standards are shown in Table 11.

All pollutant sources must be evaluated to determine if PSD regulations apply. Preliminary evaluations indicate that the proposed coal mine's product emissions (coal dust) would be less than 250 tons/year; therefore, the coal mine would not be a PSD source. However, the State PSD regulations specify that if the fugitive dust emissions cause the total potential particulate emissions to be in excess of 250 tons/year, then the source consumes PSD increment. These sources do not have to meet PSD regulations, but, the emissions from these sources are counted against PSD increment. Table 12 shows Federal and State PSD standards.

During peak production of the mine an estimated 3,846 tons per year would be emitted, with the best available control technology applied. Fugitive dust sources would account for 97 percent of the peak production emissions.

Dispersion modeling was performed to predict particulate concentrations for comparison with State and National Ambient Air Quality Standards. Areas within the active mining area, such as the mine facilities, pit area, and reclamation areas, are not subject to these standards.

The isopleth lines on Figure 6 indicate annual average particulate concentrations that could result during peak production; the highest concentration at a location off the mine site could be 4.6 ug/m^3. This level does not exceed the allowable Class II PSD annual increment for particulates. With the estimated annual background concentration added (22 ug/m^3), the ambient level should not exceed State or Federal Ambient Air Quality Standards.

In addition to the annual particulate standard of 60 ug/m^3, North Dakota has a 24-hour standard of 150 ug/m^3 that cannot be exceeded more than once per year off the mine site. Figure 7 shows the predicted highest particulate concentrations for 24-hour averaging times, resulting from the proposed action. The predicted highest 24-hour values associated with the proposed action during peak production could be as high as 28 ug/m^3. This level nearly consumes the allowable Class II PSD 24-hour increment for particulates. With the estimated 24-hour background concentration added (80 ug/m^3), the ambient level would be 108 ug/m^3. This level complies with the State Ambient Air Quality Standard and the Federal Secondary Ambient Air Quality Standards. There is a possibility that the proposed action could violate State and Federal ambient TSP standards, but this is subject to the mine emissions and the corresponding background levels in the area.

Because the proposed action totally consumes the allowable Class II PSD increments for particulates, any associated PSD source would not need to be evaluated for determination of any significant contributions.

Several small sources of gaseous pollutants are associated with surface coal mining operations.

During peak production, the relatively small gaseous emissions associated with the mining operations are not expected to violate air quality standards. Gaseous emissions for mining sources were not modeled because of their expected limited impacts to the air quality.

TABLE 11
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standards	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
TOTAL SUSPENDED PARTICULATES	Annual geo. mean conc.	60 ug/m^3	75 ug/m^3	60 ug/m^3	Annual geo. mean conc.
	Max. 24-hr. concentration not to be exceeded more than once per year	150 ug/m^3	260 ug/m^3	250 ug/m^3	Max. 24-hr. conc. not to be exceeded more than once per year
SETTLED PARTICULATES (Dustfall)	(At present there is no federal standard.)			15 tons/ sq. mile	Max. 3-month arithmetic mean in residential areas
				30 tons/ sq. mile	Max. 3-month arithmetic mean in heavy industrial areas
COEFFICIENT OF HAZE	(At present there is no federal standard)			0.4 coh. per 1000 linear ft.	Max. annual geo. mean
SULFUR DIOXIDE	Annual arith. avg. conc.		.03 ppm (80 ug/m^3)	60 ug/m^3 (0.02 ppm)	Max. annual arithmetic mean
	Max. 24-hr. concentration not to be exceeded more than once per year		.14 ppm (365 ug/m^3)	260 ug/m^3 (0.10 ppm)	Max. 24-hr. conc.
	Max. 3-hr. concentration not to be exceeded more than once per year	.50 ppm (1300 ug/m^3)		715 ug/m^3 (0.24 ppm)	Max. 1-hr. concentration
REACTIVE SULFUR (Sulfation)	(At present there is no federal standard)			0.24 mg SO_3/100 cm^2/day	Max. annual arithmetic mean
				0.50 mg SO_3/100 cm^2/day	Max. for a 1-month period
SUSPENDED SULFATE	(At present there is no federal standard)			4 ug/m^3 12 ug/m^3	Max. annual arithmetic Max. 24-hr. conc. not to be exceeded over 1 percent of the time
SULFURIC ACID MIST, SULFUR TRIOXIDE OR ANY COMBINATION THEREOF	(At present there is no federal standard)			4 ug/m^3	Max. annual arithmetic mean
				12 ug/m^3	Max. 24-hr. conc. not to be exceeded over 1 percent of the time
				30 ug/m^3	Max. 1-hr. concentration not to be exceeded over 1 percent of the time

TABLE 11 (cont.)
COMPARISON OF AMBIENT STANDARDS
FEDERAL VS. NORTH DAKOTA

	Federal Ambient Air Quality Standards (UPA)			North Dakota Ambient Air Quality Standard	
Pollutant	Wording of Standard	Secondary Standard	Primary Standard	Primary Standard	Wording of Standard
HYDROGEN SULFIDE	(At present there is no federal standard)			45 ug/m^3 (0.032 ppm)	Max. ½-hr. conc. not to be exceeded more than twice in any 5 consecutive days.
				75 ug/m^3 (0.054 ppm)	Max. ½-hr. conc. not to be exceeded over twice a year
CARBON MONOXIDE	Max. 3-hr. concentration not to be exceeded more than once per year	9 ppm (10 ug/m^3)	9 ppm (10 ug/m^3)	10 ug/m^3 (9 ppm)	Max. 3-hr. conc. not to be exceeded more than once per year
	Max. 1-hr. concentration not to be exceeded more than once per year	35 ppm (40 ug/m^3)	35 ppm (40 ug/m^3)	40 ug/m^3 (35 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
OZONE	Max. 1-hr. concentration not to be exceeded more than once per year	0.12 ppm (235 ug/m^3)	0.12 ppm (235 ug/m^3)	235 ug/m^3 (0.12 ppm)	Max. 1-hr. conc. not to be exceeded more than once per year
HYDROCARBONS (Less Meth.)	Max. 3-hr. concentration (6-9 a.m.) not to be exceeded more than once per year	.24 ppm (160 ug/m^3)	.24 ppm (160 ug/m^3)	160 ug/m^3 (0.24 ppm)	Max. 3-hr. conc. (6-9 a.m.) not to be exceeded more than once per year
NITROGEN DIOXIDE	Annual arithmetic avg. concentration	.05 ppm (100 ug/m^3)	.05 ppm (100 ug/m^3)	100 ug/m^3 (0.05 ppm)	Max. annual arithmetic mean
				200 ug/m^3 (0.10 ppm)	Max. 1-hr. conc. not to be exceeded over 1 percent of the time in any 3-month period
LEAD	Quarterly arithmetic mean		1.5 ug/m^3	1.5 ug/m^3	Quarterly arithmetic mean

Sources:

National Ambient Air Quality Standards. 1978.
North Dakota Air Pollution Regulations. 1978.

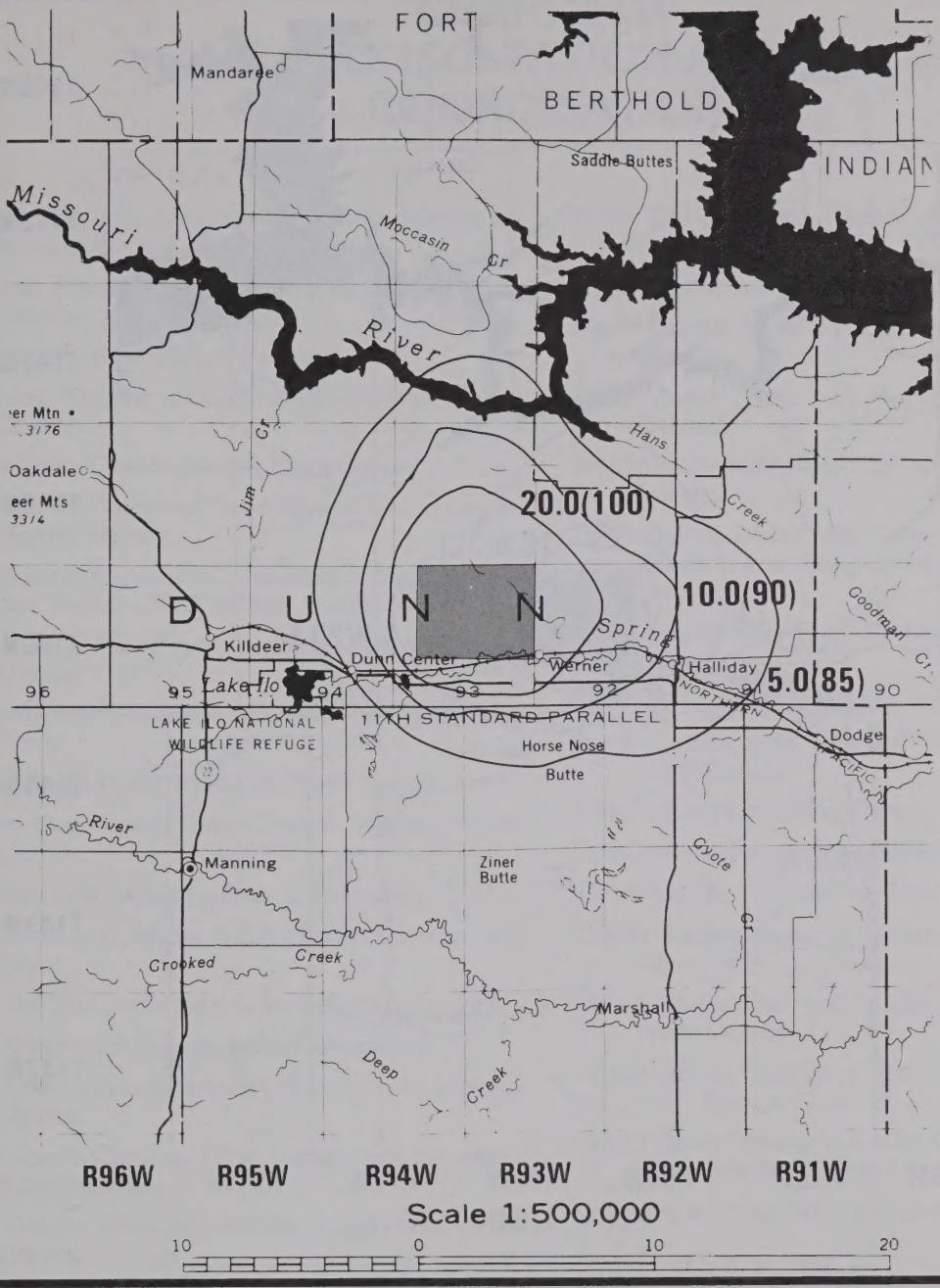
TABLE 12
FEDERAL AND STATE PSD STANDARDS

	Federal	State
Major Sources, subject to PSD review (excludes fugitive dust emissions) (t/yr)	100[1] 250[2]	100[3] 250[4]
Major Sources, not subject to PSD review-counts against PSD increment (considers fugitive dust emissions) (t/yr)	100[1] 250[2]	100[3] 250[4]
Deterioration Increments for Area Designations		
Particulates		
Class I		
annual geometric mean (ug/m^3)	5	5
24-hour maximum (ug/m^3)	10	10
Class II		
annual geometric mean (ug/m^3)	19	10
24-hour maximum (ug/m^3)	37	30
Class III		
annual geometric mean (ug/m^3)	37	37
24-hour maximum (ug/m^3)	75	75
Sulfur Dioxide		
Class I		
annual arithmetic mean (ug/m^3)	2	2
24-hour maximum (ug/m^3)	5	5
3-hour maximum (ug/m^3)	25	25
Class II		
annual arithmetic mean (ug/m^3)	20	15
24-hour maximum (ug/m^3)	91	91
3-hour maximum (ug/m^3)	512	512
Class III		
annual arithmetic mean (ug/m^3)	40	40
24-hour maximum (ug/m^3)	182	182
3-hour maximum (ug/m^3)	700	700

1. Listed sources; CFR Chapter 51:24
2. All other sources (includes coal mines); CFR Chapter 51:24
3. Listed sources; N.D.A.C. Chapter 33-15-15
4. All other sources (includes coal mines); N.D.A.C. Chapter 33-15-15

*SOURCES

Prevention of Significant Deterioration of Air Quality. 1978. Chapter 33-15-15 NDAC Requirement for Preparation, Adaption and Submittal of Implementation Plan. 1978. Title 40 CFR, Part 51.



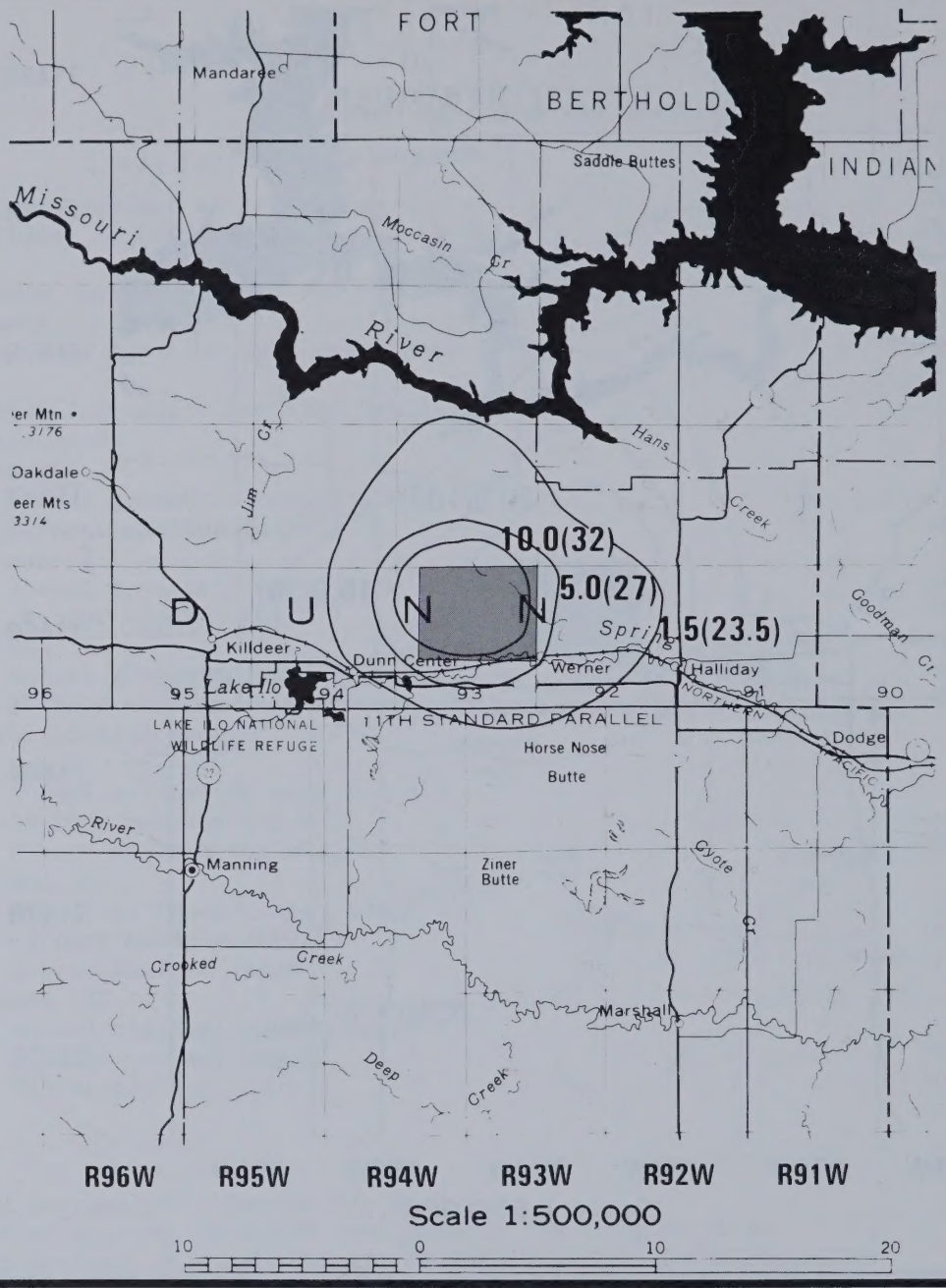
Werner Tract

N

TSP Annual Average Concentration (ug/m^3) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 6



Werner Tract

N

TSP Maximum 24-hour Concentration (ug/m^3) Isopleths

Note: Number in parenthesis indicates predicted concentration plus background concentration.

FIGURE 7

CHAPTER IV
CONSULTATION AND COORDINATION

The following organizations were consulted during the production of this document.

Badlands Human Service Center; Dickinson, North Dakota.

Cumin Associates; Billings, Montana.

Dickinson Mayor and City Council; Dickinson, North Dakota.

Dodge Town Council; Dodge, North Dakota.

Dunn Center Mayor and Town Council; Dunn Center, North Dakota.

Dunn County Agricultural, Stabilization and Conservation Service Office; Killdeer, North Dakota.

Dunn County Planning Commission; Manning, North Dakota.

Eastern Montana Social and Community Services Task Force.

Halliday Town Council; Halliday, North Dakota.

Killdeer Mayor and Town Council; Killdeer, North Dakota.

Mountain West Research; Billings, Montana.

North Dakota Business and Industrial Development Board.

North Dakota Combined Law Enforcement Council.

North Dakota Community Action Association.

North Dakota Energy Impact Office; Bismarck, North Dakota.

North Dakota Game and Fish Department; Bismarck, North Dakota.

North Dakota Geological Survey; Grand Forks, North Dakota.

North Dakota Health Department; Bismarck, North Dakota.

North Dakota Job Service; Bismarck, North Dakota.

North Dakota Social Service Board; Bismarck, North Dakota.

North Dakota State Fire Marshal; Bismarck, North Dakota.

North Dakota State Historical Society; Bismarck, North Dakota.

North Dakota State Public Service Commission, Reclamation and Siting Division; Bismarck, North Dakota.

North Dakota State Tax Department; Bismarck, North Dakota.

North Dakota State University, Sociology Department.

North Dakota State Water Commission; Bismarck, North Dakota.

Office of Surface Mining; Denver, Colorado.

Soil Conservation Services; Killdeer, North Dakota.

Three Affiliated Tribes; New Town, North Dakota.

United States Bureau of Reclamation; Billings, Montana.

United States Fish and Wildlife Service; Bismarck, North Dakota.

United States Geological Survey, Conservation Division; Billings, Montana.

United States Geological Survey, Water Resources Division; Bismarck, North Dakota.

University of North Dakota, Office of Rural Health.

BLM Library
Denver Federal Center
Bldg. 85, OC-521
P.O. Box 25047
Denver, CO 80225

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WERNER TRACT
SUMMARY MATRIX
RESOURCE AND ENVIRONMENTAL CONSIDERATIONS

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Topography	Some rolling hills.	Modify some of surface.	Low	Good	
Geology and Minerals					
Geologic Hazards	None identified.	None	N/A	Good	
Potential for other Minerals	Medium (Oil and Gas) - This is located near Saxon Oil Field.	Moderate - There is ongoing exploration activity and an active field in the area.	Mining could interfere with development of oil and gas.	Good	
Paleontological Resources	None identified to date.	Will improve knowledge of the resources near the mine.	Low	Good	
Soils and Reclamation Potential					
Soil Erosion Potential	Wind and Water - Mod to high over most the tract.	Increase with soil handling operations but little overall change.	Minimal	Good	
Toxic Elements in Soil	No problems	None	None	No data.	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Chemicals Corrosive to Metal or Concrete in Soil	Corrosivity of most soils to Untreated steel, High; Concrete, Low.	None	None	Good	
Highly Saline/ Sodic Soil Conditions	Most of the soil rated "poor" in Table 2 is saline/sodic, about 900 acres.	These areas can possibly be improved by replacing with better plant growth material from surrounding soils and/or overburden.	Minimal - possible slight increase in productivity.	Good	
Character of Subsurface Material and/ or Interburden	Overburden composed of shale, siltstone, and sandstone with covering of glacial till on some uplands. Often the top 10 to 20 feet and sometimes as much as 50 to 80 feet of the overburden is suitable for use in reconstructing soil profiles. The remainder has problems such as high sodium and clay content.	Some instability problems (settling, piping) may appear with the onset of reclamation. Some of the overburden could be used to improve areas with soils rated "poor" for final cover of surface-mined land.	Minimal	Good	Physical and chemical data from 16 core drill holes a few miles south in the Dunn Center SE tract.
Reclamation Potential				Outstanding	

Based on soil suitability for final cover of surface mined land, the chance for successful reclamation of most individual landowner's holdings and for the tract as a whole appears to be high. However, there are four separate parcels that have nearly half or more of their acreage rated "poor". These may require a very intensive reclamation effort to ensure successful rehabilitation.

The breakdown of soil suitability totals from Table 2 are as follows: "Good" - 8,358 acres, 65%; "Fair" - 3,456 acres, 27%; and "Poor" - 986 acres, 8%.

Precipitation could be a limiting factor for reestablishing vegetative cover some years.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Hydrology					
Water Quality	Low flows through Spring Creek stream are maintained by discharge from the shallow aquifers.	Mining near Spring Creek would degrade groundwater which would discharge into Spring Creek and result in degradation of low flow water quality.	Degradation from the existing quality will violate state water quality standards. The stream's usefulness as an irrigation water source will be degraded. Spring Creek has been determined to have good potential for being an Alluvial Valley Floor.	Hydrology - Good Impact Prediction - Acceptable	The size of the buffer zone necessary to avoid this impact is not determinable. Generally it is a minimum of one mile and maximum of three miles. Final determination of Alluvial Valley Floors will be made at the mine permit stage.
Disruption of Floodplain of Spring Creek	Vegetation and stable soils provide protection against degradation of the water quality of Spring Creek.	Digging or stockpiling within the floodplain during a flood event will degrade the quality of water in Spring Creek.	Higher suspended and dissolved concentrations are detrimental to most water quality standards.	Good	Eliminating disturbances within the 100 year flood recurrence zone would minimize risk. Properly designed road crossings could be built.
Drawdown of Shallow Groundwater Levels	Many wells in and surrounding the tract rely on shallow groundwater for domestic and livestock supplies.	Wells finished in the mine disturbance zone near an open pit will have lowered water levels during mining.	Between 25 and 35 wells used for domestic and stockwater supplies will be affected.	Hydrology - Outstanding Well Inventory - Outstanding.	This will be a short-term impact that will only occur to a few wells at a time.
Degradation of Groundwater Quality	Generally shallow groundwater does not meet drinking water quality standards. It is acceptable and used for domestic and stockwater purposes.	Groundwater quality will be degraded in the tract.	Between 14 and 20 wells used for domestic and stockwater purposes will be affected.	Hydrology - Outstanding Well Inventory - Good	Replacement water supplies are available at deeper depths.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Vegetation and Agricultural Production					
Cropland	There are 3141 acres of land in the tract that are currently being cropped annually.	Average annual loss of 87 acres excluding 543 total acres of summer fallow. Annual production on this 87 acres would be 2227 bu. of wheat. Maximum loss in any one peak mining year would be 861 acres and 22,042 bu. of wheat.	Moderate to high, depending upon individual operation. Low to moderate for overall tract production.	Good	
Rangeland	Average annual production is 3,164 AUMs.	Average annual loss of 79 AUMs. Each acre would be out of production from 10 to 15 years. Maximum loss for any one peak mining year would be 1582 acres and 790 AUMs.	Moderate to high, depending upon individual operation. Low to moderate for overall tract.	Good	
Agriculture	There are 20 operators in the tract.	The same number of operators will be affected, to varying degrees, by a long term but temporary loss of acreage for agricultural production.	Very significant to the operator involved.	Outstanding	
	30% of the involved operators acreage is in the tract.			Outstanding	
	59% of the acreage in the tract is operated by lessees.	Non-owners will lose the use of their leased acreage with no compensation.	Significant to non-owners.	Outstanding	
Threatened or Endangered Species	There are no threatened or endangered species (on the Federal List) in the tract.	None	None	Good	

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Land Use	Agricultural use, minor roads and local utilities.	Temporary displacement of existing land use. Relocation or bypass of existing facilities.	Short term, see Vegetation and Agriculture section. Minor inconvenience.	Acceptable	
Recreation	Less than 5% of tract used for recreation.	Loss of recreational areas and added stress on available recreational opportunities.	Limited recreational opportunities make impacts significant.	Good - Based on current studies.	
Aesthetics	Dynamic agriculture activity of high visual quality but low scenic value. Favorable topography limits views of the tract.	Short-term changes in views until after reclamation are less desirable than the existing but are not seen from observer positions of much importance.	Insignificant	Acceptable	
Wildlife					
Sensitive Wildlife and Essential Habitats	Sensitive wildlife habitat - 38% of area for 30 sensitive species, whooping crane, northern swift fox, black-footed ferret are identified with area.	Coal mining and attendant actions would severely disrupt and destroy locally significant wetlands interspersed with native prairie which singly and in composite constitute the essential habitats for 30 wildlife species and many more common wildlife. Offsite aquatic habitats in Spring Creek, Knife and Missouri Rivers would be recipients of potential point and non-point pollution.	There would be a significant area loss to wildlife resources if strip mining occurs in the essential wetlands, woodlands, and native prairie.	1980 CIR aerial photo interpretation by Fish & Wildlife Service, Western Energy & Land Use Team. Unsuitability Criteria Application Team (FWS, NDGF, & BLM Biologists). Wildlife data quality is high.	To date there are no data to direct successful recreation (compensation) of native woodlands and wetlands after strip mining in this country. Native prairie of native plant species has not been recreated from mine spoil. If some forms of habitat replacement is achieved during mining and thereafter, then the negative impacts to the wildlife resources would be proportional to the successful compensation.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
General					Increased poaching and disturbance would significantly reduce all wildlife populations in the region. If not controlled, it would significantly reduce recreation opportunities.
Cultural/ Historical	Specific data reveals important cultural resources that must be avoided in mining process.	Loss of sites as a result of mining activity.	Irreplacable loss of important scientific information.	Good	Application of unsuitability is going on at this time.
Net Energy Analysis	No fossil fuels are being produced from this tract.	A total of 7.4 million tons of coal (2.8 million tons of federal coal) would be produced annually.	Production: 6800 Btu/lb. of coal Consumption: 37.7 Btu/lb. of coal Ratio of production to consumption: 180:1	Acceptable	
Climate and Air Quality	Good	Increased particulate concentrations would occur from proposed action. Does not violate the ambient air quality standards or the class II PSD standards for particulates.	Insignificant	Fair	Because the proposed action nearly consumes the allowable class II increments for particulates, any associated PSD source would need to be evaluated for determination of any significant contributions.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
		Social and Economic Conditions			
Employment	Communities of Dodge, Dunn Center, and Halliday, North Dakota have one or more inadequate services with present employment/population.	Employment increases would occur in Dodge, Dunn Center, Halliday, and Killdeer.	High employment changes- Dodge, Dunn Center, Halliday, and Killdeer.	Outstanding	
Population	Communities of Dodge, Dunn Center, and Halliday, North Dakota have one or more inadequate services with present population.	Population increase would occur in Dodge, Dunn Center, Halliday, and Killdeer.	High population changes- Dodge, Dunn Center, Halliday, and Killdeer.	Outstanding	
Regional Income	$4560 estimated Regional income per capita.	Minor increases in regional per capita income.	Insignificant	Acceptable	
Infrastructure Assessment (Community Services)	Dodge - 1 inadequate service Dunn Center - 3 inadequate services Halliday - 1 inadequate service Killdeer - 0 inadequate services	1990 Full Operation Dodge with tract - 7 inadequate w/o tract - 3 inadequate Dunn Center with tract - 11 inadequate services w/o tract - 3 inadequate Halliday with tract - 9 inadequate services w/o tract - 3 inadequate Killdeer with tract - 9 inadequate services w/o tract - 11 inadequate	Highly significant due to number of services becoming inadequate with tract development as well as types of services which would become inadequate (i.e., sewage treatment, solid waste disposal, water storage, water supply, etc.)	Acceptable to good depending upon the community.	Community services which are inadequate without tract-related population growth would experience additional strains due to increased demands on an already inadequate service situation. Based an Assessment of 15 community services.

ELEMENT	PRESENT SITUATION	ANTICIPATED EFFECT OF LEASING/DEVELOPMENT	SIGNIFICANCE OF ANTICIPATED IMPACT	DATA RELIABILITY	COMMENTS
Perception of Community Services	Stark County - Inadequate law enforcement perceived to be a problem. Dunn County - Shortage of roads, medical care, day care for children perceived to be a problem.	Not applicable	Not applicable	Acceptable	
Social Attitudes	Stark - 24 interviewees Residents - Less than ½ unconditionally supported mining. Officials - generally expressed support for development. Dunn - 11 interviewees Residents - one stated opposition to mining. Officials - Generally expressed support for mining. State concerns - successful reclamation, protection of water, air quality, rapid growth in communities.	Not applicable	Not applicable	Acceptable	
Quality of Life	Dunn and Stark Favorable characteristics - uncrowded friendly, social environment Unfavorable - climate, shortage of medical care, increased traffic and road maintenance problems, entertainment facilities.	Depersonalization of informal small town atmosphere.	Effects of tract development in itself not particularly significant but would result in significant effects when combined with oil and gas development.	Acceptable	

WERNER TRACT
UNSUITABILITY CRITERIA RESULTS

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
1. Federal land systems	No	---	No	---
2. Rights-of-way and easements	No	---	No	---
3. Buffer zones	Yes	No	No	Exceptions may be applied at mine plan.
4. Wilderness study areas	No	---	No	---
5. Scenic areas	No	---	No	---
6. Land used for scientific studies	No	---	No	---
7. Historic lands and sites	Yes	---	No	---
8. Natural areas	No	---	No	---
9. Federally listed endangered species	Yes, whooping crane and northern swift fox known or believed to use these regions.	---	Swift fox and ferret current data.	Exclusion of strip mining from wetlands and prairie dog towns would protect most whooping crane areas and ferret habitats.
10. State listed endangered species	No	---	No	None exist.

Criterion	Applicable to Tract	Exception Used (if applicable)	Additional Data Needed	Comments
11. Eagle nests	No	---	No	---
12. Eagle roosts and concentration areas	No	---	No	---
13. Falcon cliff-nesting sites	No	---	No	---
14. Migratory birds	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	Seven species in combination with Criterion 15.
15. State resident fish and wildlife	Yes	Yes, interagency team applied exceptions as suitable for mining with stipulations.	No	About 30 species in combination with Criterion 14.
16. Flood plains	Yes	---	No	---
17. Municipal watersheds	No	---	---	---
18. National resource waters	No	---	---	---
19. Alluvial valley floors	Yes	---	Yes	Final determination at mine plan.
20. State proposed criteria	No	---	No	None exist.

PRELIMINARY FACILITY EVALUATION REPORT

PRELIMINARY

FACILITY

EVALUATION

REPORT

PRELIMINARY FACILITY EVALUATION REPORT

GOALS AND OBJECTIVES

The Fort Union Regional Coal Team, in its consideration of leasing federal coal, will address the likely coal end-uses and their implications. The purpose of evaluating how the coal will be used is to present the most probable major impacts of development.

The end-use facility evaluations are at a reconnaissance level and the reports are presented only as general approximations of facility characteristics and impacts.

The uncertainty of actual end-use facilities and the inherent problems in defining a "typical facility" limit end-use analysis to broad generalizations. The evaluations are not meant in any way to substitute for detailed site specific evaluations, EISs, or analyses which come later when mining and facility projects are actually proposed. The end-use facility evaluations will not preclude any federal, state, local, or private decisions concerning actual end uses, facility siting, or end-use restrictions. The end-use reports are meant only to provide additional information to be used in decisions concerning the leasing of federal coal in the Fort Union Region and should not prejudice any later decisions.

End-use evaluations, referred to as preliminary facility evaluation reports, have been prepared for those tracts for which a new coal-use facility is expected to be built. One of the three proposed end-use facilities has been assigned to those tracts based on expressions of interest, tract size, or existing facilities. The typical facilities to be considered are: a 250 million standard cubic feet per day gasification plant; a 1,000 megawatt electric power generation plant; and an 85,000 barrel per day indirect coal liquefaction plant.

Part I of the report summarizes what the assigned typical end-use facility might be like. The description of the facility gives plant size, process technology, plant requirements (fuel, land, water, power), emissions, and other characteristics of facilities likely to be proposed in the Fort Union Region. The description includes ancillary facilities and a discussion of construction and operational aspects of the facility that are relevant to determining impacts that could occur in the vicinity of the tract.

The facility description is based on existing analyses, studies, environmental impact statements, and consultation with State and industry representatives. Part II of the facility report is an analysis of the facility impacts on the tract area.

The preliminary facility evaluation reports will be used by the Regional Coal Team to rank federal coal tracts with a better understanding of likely future development impacts and implications.

PART I
ASSUMPTIONS AND VARIABLES

The typical electric power facility characteristics are based on numerous assumptions and reasonable values for important variables. Some of the assumptions and variables are based on best estimates. Others are based on existing literature, facilities, and on input from industry sources.

Facility Location, Type, and Size

Because of the economics of lignite coal, it was assumed in the early stages of the Fort Union coal leasing process that the end-use facilities would be near the tracts to be leased. The energy value of lignite coal as well as the water content make the transporting of lignite for long distances uneconomical. For purposes of issue level impact analysis, the electric power facility assigned to the Werner tract is not specifically located but assumed to be near the tract. Such an assumption will eliminate the problems of arbitrarily siting facilities. Facilities were sited, however, for the air quality modeling. Where specific site location information was available from potential project developers it was used in the facility analysis.

The proposed electric power facility will produce 1,000 megawatts (gross) of power. The coal-fired electric power plants being constructed or planned in the region generally have from one to three generation units; each producing from 400 to 500 megawatts of power. A facility consisting of two 500 MW units was chosen to be representative of a typical electric power facility.

Construction Period

The construction time span for an electric power facility can vary greatly. A company hiring four to five thousand construction workers could complete the proposed facility in as short a time span as three years. A company could choose to lengthen the construction period or build parts of the plant capacity in two or more construction phases. This would reduce the construction work force and spread construction over as many as ten years.

The assumption is that the facility will be constructed in phases. For the two unit electric power plant, the second unit would begin construction in the third year after the first unit is begun. The total construction period would cover approximately eight years. Work force numbers were supplied by the Basin Electric Power Cooperative. The average yearly employment

figures are based on the projected work force for the Antelope Valley Power Plant.

Water Requirements

Water demands for an electric power facility depend on production technology, plant load factor (percent of output capacity), operation time, and water quality. The values used for water requirements are based on estimates from Basin Electric. The value for gallons per minute is an estimate of average water use for the facility. The yearly requirements are an approximation based on an operation factor assumed for the facility. This operation factor indicates the time the facility will be in operation each year. The electric power facility will assume an average load factor since peak power will not be needed full time due to varying load demand.

For analysis purposes, water for the electric power facility is assumed to come from Lake Sakakawea.

Emissions

The air emissions for th electric power plant will depend primarily on the facility's production process, the amount and quality of coal burned, and the level of pollution control.The electric power facility would use approximately 10 percent of the gross wattage it produces. An assumption affecting air emissions from a generic facility is the quality of the coal. The sulfur, ash, and water content of the lignite will not only influence emissions per ton of coal burned, but will also determine the amount of coal required for a given facility. The air emissions from any type of coal conversion facility will be a function of the conversion process characteristics and the emission control technology used at the facility and the level of control used.

The impacts resulting from air contaminants emitted by the coal end-use facility are deduced by using established air quality standards above which deleterious effects of the contaminants are implied to occur. A facility's ability to meet air quality standards assumes there would be no significant deleterious effects to human health, animals, or vegetation. Such an assumption is the subject of continuing discussion and is disputed by certain research studies. A more detailed discussion of this issue can be found on pages 37-94 in the Final West-Central North Dakota Regional Environmental Impact Study on Energy Development (October 1978). The facilities could also emit certain pollutants for which there are no standards. The anticipated levels of air quality concentrations of contaminants are obtained by measuring existing levels of air quality and adding computer simulation of the atmosphere loading resulting from the end-use facility.

The air quality impacts are considered in terms of ambient air standards and prevention of significant deterioration standards. Under authority of the Clean Air Act of 1970, the State of North Dakota has promulgated its own ambient air quality standards which are equal to or more stringent than the Federal standards. The purpose of the North Dakota Ambient Air Quality Standards is to control the quality of the air over North Dakota such that, a) the health of sensitive and susceptible segments of the population will not be adversely affected; b) concentrations of pollutants will not cause public nuisance or annoyances; c) significant damage to animals, ornamental plants, forest and agricultural crops will not occur; d) visibility will not be significantly reduced; e) metals or other materials will not be significantly corroded or damaged; f) fabrics will not be soiled, deteriorated, or have their colors affected; and g) natural scenery will not be obscured.

In May of 1977, the North Dakota State Department of Health (NDSDH) received a delegation of responsibility from the Environmental Protection Agency (EPA) for administration of the Prevention of Significant Deterioration (PSD) program and regulations adopted by EPA. The NDSDH had previously adopted PSD regulations, recognizing that the protection of the air quality resource was in the interest of preserving a quality of life and the environment both endowed to North Dakota's citizens.

During 1975, 1976, 1977, and 1978, the NDSDH received applications for and granted air quality permits to new sources in west-central North Dakota. All new sources placed into operation after January 6, 1975, are subject to the provisions of the PSD regulations of EPA and adopted by the NDSDH.

The Clean Air Act Amendments of 1977 designated three levels of allowable deterioration of air quality in regions where air quality was better than the National Ambient Air Quality Standards. All of North Dakota was defined as a Class II area with exception of four smaller areas which were defined as Class I areas. These Class I areas are the Theodore Roosevelt National Park north unit, south unit, and Elkhorn Ranch and the Lostwood National Wildlife Refuge.

The assessment analysis of proposed air quality impacts (deterioration) by proposed new sources is achieved with computer models. These models simulate the physical processes of atmospheric transport, dispersion, chemical transformation, and removal of air contaminants with resulting levels of concentrations of the contaminants. Modeling has been and remains the only tool available to determine air quality impacts of proposed sources or source modifications, since these new sources are not yet producing air contaminant emissions.

The computer modeling assessments of impacts led the NDSDH to declare in 1979 that the increment of allowable Class I area air quality deterioration for sulfur dioxide (SO_2) had been consumed and allocated to the new sources which had been granted construction permits from 1975. This decision further implied that

no additional sources could construct and operate within the geographic corridor bounded by the units of the Theodore Roosevelt National Park and the sources located eastward.

An extensive, detailed discussion of the preceeding paragraphs has been published in the Final West-Central North Dakota Regional Environmental Impact Study on Energy Development (October 1978). Copies are available from the NDSDH.

Recently, several applications for permits to construct air pollution sources have been submitted to the North Dakota State Department of Health. According to the applicants' analyses, which utilize more advanced modeling techniques, compliance with all applicable standards was demonstrated.

The NDSDH is currently evaluating these applications as to the appropriateness of the air quality technique. The Department is concurrently establishing its own mesoscale air quality modeling technique in an attempt to standardize the methodology and air quality modeling input data variables. Once this has been accomplished, the actual merits review for each new application can begin.

The limiting case appears to be the question of increment consumption over the Theodore Roosevelt National Park, a Class I area. Ambient Air Quality Standards and PSD Class II increments have not previously prevented the granting of an air quality permit.

At this point in time, no new conclusion regarding the status of the Class I increment has been reached by the NDSDH. If any increment remains, permits would be granted, probably on a first-come first-serve basis, to as many of the applicants as the available increment would allow. Should the Department continue to find that the increment has been consumed, no permits to construct would be granted.

If permits are not granted, the applicants may pursue the variance procedures provided by the Clean Air Act and State Regulations. Applicants may also decide to pursue an offset mechanism which would best suit their individual situation(s).

Given the above existing new source situation, the quantification of air quality impacts resulting from additional facilities associated with certain coal lease tracts is impossible. Discussion of site specific impacts without addressing the interactive and cumulative impacts would have little decision value.

For the purpose of this analysis, each end-use facility which has been assigned to a particular coal lease tract will be discussed. This discussion will contain general statements regarding facility impacts on the air quality. Impact analysis will be based on previous air quality modeling experience and past actions by the NDSDH in permitting similar facilities. Comparisons to applicable standards can be accomplished. For example, when considering these facilities (electrical generating facility or synfuel facility) by themselves, the Ambient Air Quality Standards can be met. Also, the PSD Class II Standards can be met. This is known because these types of facilities have been permitted in the past.

The general statements will be appropriate only within the context of some qualifying conditions. A facility's impact on a given receptor is directly proportional to its distance from that receptor. Generally speaking, the closer a facility is to a receptor, the greater its impact. Therefore, considering the given type and size of facilities, a screening modeling exercise must be undertaken in order to determine the distance a facility must be removed from the park in order to meet the Class I Standard. This distance will be compared to the distance each end-use facility associated with the coal lease tract is from the Class I area.

The approach mentioned above will only demonstrate compliance/noncompliance with the applicable standards without consideration of interaction with other sources. This analysis cannot be substituted for a detailed permit review and care must be taken to use this information with the proper qualifiers and not be taken out of context.

Solid Wastes

Estimates of solid wastes from the facility are based on figures from Basin Electric. Estimates for ash and sludge could vary considerably depending on the ash content of the coal and the pollution control technology used. Planned facilities are proposing to dispose of solid wastes in the nearby mines.

ELECTRIC POWER FACILITY

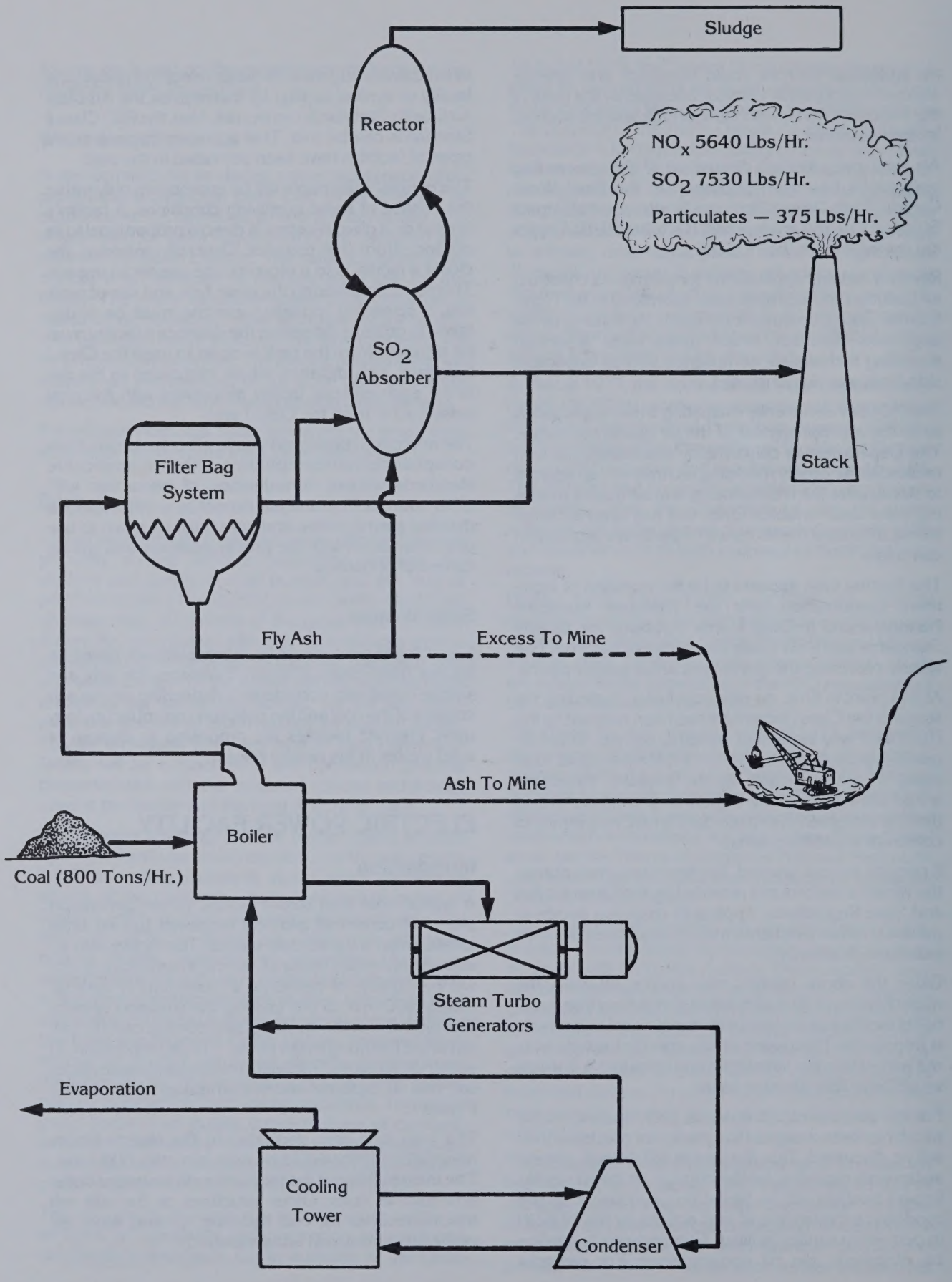
Introduction

A typical coal fired steam electric power generation plant will consist of two 500 megawatt (gross) units located near a lignite coal source. The facility with an average operation factor of .90 and a load factor of .85, will be capable of delivering a maximum of approximately 900 MW to the existing transmission system. The facilities for the electric power complex would consist of the following major areas: 1) coal preparation, 2) power generation, 3) pollution control and waste disposal, and 4) pipeline and transmission facilities. See Figure 1.

The total land area dedicated to the electric power generation facility would be approximately 600 acres. The main building at the facility site will house the boiler and turbine units. Other structures at the site will include facilities for coal handling, cooling water, air pollution control, and administration.

Figure 1

TYPICAL ELECTRIC POWER FACILITY



Employment

The construction of two electric power generation units is expected to last approximately eight years. The average annual number of workers required for plant construction will peak in the third year of construction when substantial work on both units would be underway. The peak construction work force is expected to be approximately 1,900 workers in the second quarter of the third year. Once in operation, the facility will permanently employ about 200 people (See Table 1).

TABLE 1
AVERAGE YEARLY EMPLOYMENT

Year	1	2	3	4	
Construction	309	1138	1248	7982	
Permanent				36	
Year	**5**	**6**	**7**	**8**	
Construction	666	580	682	168	
Employment	102	108	108	200	etc.

Source: Basin Electric Power Cooperative for Antelope Valley Station.

Coal Preparation, Storage, and Handling

Lignite coal would be transported from a nearby mine to a three-day live storage pile or a sixty-day dead storage pile. From the live storage pile, the coal would be sent by conveyor to be crushed before being transferred to the plant silos for intermediate storage. Finally, coal would be conditioned before being introduced into the furnace for ignition. A typical plant would burn an average of approximately 800 tons of coal per hour or about 5.5 million tons per year. See Figure 2.

Power Generation

In a coal fired electric power plant, the crushed coal is combined with air supplied by forced-draft fans and then ignited and burned in the boiler furnaces. The combustion in the boiler furnace produces heat which creates steam from feed water entering the boiler heat-exchange system. After releasing energy through expansion in the high-pressure section of the turbine, steam is returned to the boiler for reheating. After being reheated, steam is returned to the intermediate section and subsequently to the low-pressure section of the turbine. Spent steam passes through the condenser where waste heat is removed, and the condensed liquid is returned to the boiler feed water system. Combustion gases from the furnace are exhausted to the atmosphere through the pollution control devices. Steam energy is converted to mechanical energy by the turbine and subsequently transformed into electrical energy by the generator. Generated power is routed through the main transformer for voltage step-up and then to a switchyard and transmission line system for distribution.

Water System

The water for the power plant systems would come from a nearby river or impounded water source. Raw water would be processed to reduce hardness and alkalinity. The treated water would then be stored for use. Demineralization of the filtered water for boiler makeup will be necessary to provide water of the required quality for the steam generation system. There will be several holding ponds included at the facility to store recoverable water.

The power plant will require approximately 13,000 acre-feet of water annually. The plant would use about 9,000 gallons per minute when in operation.

Cooling System

The cooling system for the electric power facility would be mechanical-induced draft wet-type cooling towers. Cooling tower blowdown would be sent to a holding pond to be used for ash sluicing, scrubbers, or coal dust suppression.

Emissions and Pollution Control

Burning lignite in the boiler produces gaseous emissions, fly ash and bottom ash. The gas from the boiler will pass through a fabric filter baghouse and an SO_2 dry scrubber, and will be dispersed by a 600-foot stack (See Table 2).

TABLE 2
AIR EMISSIONS (lbs/hr)

Particulate	Sulfur Dioxide	Nitrogen Oxides
375	7530	5640

Source: Estimates based on emission figures from the American Natural Resources Company.

Bottom ash from the main boiler, pyrite rejected from the pulverizer and ash discharged from the hoppers will be hydraulically conveyed to dewatering bins. The ash will then be loaded into trucks and transported to the adjacent mine for disposal.

The fabric filter baghouse will be installed for the removal of particulate fly ash. The fly ash and scrubber product will be mixed with water and loaded into trucks for disposal in the mine.

The plant will include a dry scrubbing system to absorb SO_2 from the flue gas. The scrubber product will be treated prior to disposal with dry fly ash. The fly-ash/scrubber product would likely be blended with water for dust control and stabilization. Emission of nitrogen oxides will be controlled by designing the

boiler for proper mixing and flame quenching. The quantity of wastes would be approximately 80 tons per hour of fly-ash/scrubber product and 10 tons per hour of bottom ash.

Utility and Transportation Corridors

Water will be pumped from the water source to a surge pond. The water pipelines will require a right-of-way consisting of a 100 foot wide construction easement and a 50 foot wide permanent easement. The surge pond would have a water surface area of approximately 42 acres and would contain 1,050 acre-feet of water. Transportation corridors will be required for roads and a railspur. The transmission line leaving an electric power facility would be a 500 KV line with a right-of-way 150 feet wide connecting with an existing system.

PART II

RELATIONSHIP OF TRACT AND FACILITY

The Werner tract is located in Dunn County, North Dakota, two miles northeast of the town of Dunn Center and directly northwest of Werner. The tract consists of 12,788 acres of land with recoverable coal reserves of 297.3 million tons.

The likely use of coal mined from the tract would be for an electric power generating plant. To consider the impacts of this coal facility, it is assumed that the typical electric power facility described in Part I would be constructed adjacent to or near the tract with no specific site designated, except for purposes of air quality analysis.

Soils, Vegetation and Agriculture

In the Werner tract area, the agricultural land consists of approximately 70 percent cropland, 2 percent hayland and 28 percent rangeland. Based on 1978-1979 county averages determined from ASCS data and from BLM grazing files annual production per acre would average 26 bushels per acre of wheat, 1.6 ton per acre for hayland, and .5 AUMs per acre for rangeland.

Assuming the same agricultural land use distribution for the 600 acre disturbance estimated for a generic electric power facility, agricultural production lost on the facility site would be 7,800 bushels of wheat annually, in a worst case situation analysis, for the life of the facility.

A short-term disruption of 12 acres per mile would result during construction of an undetermined length of water pipeline. Roadways would disturb 14.5 acres per mile. A railroad spur, also of undetermined length until final siting of the facility would eliminate agriculture on 18 acres per mile for the entire life of the facility.

Erosion losses due to wind and water from ground disturbed during the construction phase of the facility, given State permitting stipulations, would not be significant. Regionally, the agricultural production lost on the 600-acre facility site also would not be significant. Because of the alkaline soils in the tract area and downwind, no deleterious acid-forming effects to the soil due to acid rains from the facility would be anticipated.

There is evidence documented in the literature (West-Central North Dakota Regional Environmental Impact Study on Energy Development, 1978) that there are potential negative impacts to vegetation and to livestock downwind from such a facility due to nitrogen oxides, sulfur dioxide and particulate matter. Such negative impacts would be analyzed in detail at such a time as more specific information becomes available in conjunction with facility permit application with the State permitting authority.

Water

Water requirements for an electric power generating facility are approximately 9,000 gallons per minute or 13,000-acre feet per year. The likely source of water for industrial use is Lake Sakakawea. Withdrawal of water would have no significant impact upon the reservoir. Facility wastes of ash, sludge and water disposed of in the mine do have the potential to degrade water quality if they are disposed of within the saturated zone which develops upon reclamation. Present regulations require state approval of disposal sites.

Land Use

Changes in land use include displacement of existing use, increased intensity of existing uses and the introduction of new uses. The site of the facility is likely to displace agricultural use.

The optimum site conditions for facilities are the same as for agriculture; that is, gentle topography and soils with good drainage characteristics. The increase in population of communities results in demand for new housing, additional commercial development, and expanded public use facilities. The area of this development will likely be on off-site agricultural land. The on-site displacement of agricultural land use is discussed in the Agriculture section of this report.

Increased population would create a demand for community services as addressed in the Social and Economic Conditions section of this report. This demand implies a need to expand existing facilities and commercial establishments or to create new ones. Existing commercial establishments may suffer through the construction of new facilities outside the

downtown areas. Public services would be stretched in the short term by lack of capital to implement change due to increased population. Parking shortages, traffic congestion, and excessive wear and tear on roadways would make downtown areas less habitable. Municipal organizational structures and physical space may prove inadequate with increased population. For example: a part time mayor may be overworked, processing of permits may delay private building construction, and filing space for public records may prove inadequate.

With the influx of workers and their families, a change in the composition of the community is inevitable and demands for new forms of public and commercial facilities for shopping, recreation, and entertainment would ensue. These types of changes are likely to result in dissatisfaction by both the existing resident population and the newcomers. Conflicts are likely to occur as a result of the contrast in the lifestyles of these populations.

Existing planning varies considerably from community to community. Some are prepared for change presaged by recent oil and gas development in some areas, while others are ill prepared for the change in population anticipated.

Current perception of county residents with regard to roads, retail opportunities, recreational/entertainment facilities, and housing are discussed in detail in Chapter 2 of the Site Specific Analysis for Economic and Social Conditions.

Similarly, forecasts by city/county planners regarding likely changes in community services resulting from facility related population growth are presented in detail in the Economic and Social Conditions section of this report.

Recreation

Recreation in the tract vicinity is limited to dispersed big game hunting. Although there are some facilities in the tract vicinity, those existing regional recreation facilities (community camping and picnic areas, Theodore Roosevelt National Memorial Park, and Lake Sakakawea) are expected to receive the majority of recreation demand. The regional EIS will address in more detail the expected regional demand for increased population for recreation.

Wildlife/Fisheries

Impacts of an electric power facility on wildlife around the Werner tract could occur in two areas: 1) impacts from destruction of habitat and 2) direct and indirect impacts from the increase in human population.

The removal of vegetation for a 600-acre electric power facility and the expansion of urban areas, highways, and railroads would prevent or reduce the use of an area by wildlife regardless of the type of vegetation removed. Much of the area around the tract contains native prairie, wetlands, and some shrublands essential to many species. While these essential habitats occur all around the tract, a powerplant could be located in certain areas with minimal haibtat destruction.

If powerlines, pipelines, access and haul roads are constructed in key wildlife areas, partial or total destruction of habitat would occur depending on the magnitude of development. The worst case would destroy present wildlife populations in the area. Wildlife oriented recreation such as hunting and wildlife observation would have to be sought elsewhere. Wildlife would be impacted by eagle electrocutions on powerlines, migratory bird mortality from striking powerlines close to wetlands, road kills along transportation routes through important wildlife areas, harassment of wildlife by off-road vehicle use, increased poaching, and habitat destruction.

Poaching and road kills have increased dramatically in areas of North Dakota, Montana, Wyoming, and Colorado where energy development has occurred. The problem is compounded in areas where transportation corridors are located in important wildlife areas and shift changes coincide with wildlife feeding periods. This situation could occur in the Werner tract area.

The impact to wildlife could be mitigated by: 1) siting the electric power plant and associated facilities with regard for essential wildlife areas, 2) adjusting work shifts to avoid feeding times of highly visible wildlife, 3) mass transportation of employees, 4) providing funds to State fish and game agencies to better control illegal shooting of wildlife, and 5) adopting a poaching clause in union contracts.

Taking water from shallow bays in Lake Sakakawea could have significant adverse impacts. These areas are prime nursery and spawning areas for sport, commercial, and forage fish. Taking water from deeper noncritical areas of the reservoir could reduce or eliminate the significant impacts to fisheries. The cumulative increases in industrial, urban, and other water uses will dictate the severity of the impacts on fisheries. The cumulative impact will be addressed in the regional EIS to be prepared.

Cultural Resources

The Werner tract area has not been inventoried to date. Information from existing inventories (BLM unpublished data, Davis 1976; Greiser 1980) outside the Fort Union coal region suggests that the predominant prehistoric sites should be lithic scatters of varying size, density and function (ca. 70-80%). Other expected prehistoric resources include stone circles (ca. 10%-20%), ceramic-bearing sites, rockshelters, and kill sites (ca. 10% combined). Expected historic resources include homestead and ranching remains (ca. 50%), historic

grafitti and rock art (ca. 20%), freight roads, dugouts, cairns, trading posts, burials and battle sites (ca. 30% combined). Further information on cultural resource occurrence, distribution and significance cannot be quantified prior to inventory.

Visual Impacts

Central North Dakota has very high but common visual quality. In the absence of other types of visual experiences, the landscape is not highly valued as scenery because of the vast distances involved in crossing this relatively uniform area. Most highways roll with the landform so views alternate between nearby features at low points and panoramas of up to thirty miles at high points in the roadway profile. The landscape is seen in terms of these short vistas of landscape elements that will not be seen again, and short duration views of distant landscapes in which any vertical object or landscape feature serves as a focal point.

Large structural features in the central North Dakota landscape contrast with the landscape both in terms of the visual surface (the character of what is seen) and in terms of function. Vertical and linear components of a facility, because of hard architectural edges of the structures, and the transitory nature of panoramic views imply a visual importance of these large objects for orientation. The aesthetic response is secondary to this visual function.

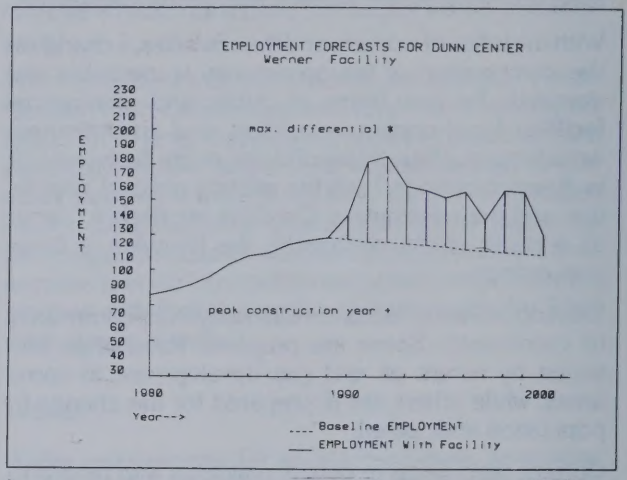
Neglecting cultural bias, the aesthetic response to stark architectural lines and pure planes of color contrasting with the simple curvilinear landforms of the countryside can be considered positive. This visual experience would be immediately comprehensible and would provide relief from a relatively uniform countryside. Beyond this initial response, however, are responses with origins in cultural bias and the individuals' relationships to the land. The greatest effect would be upon local residents with memories of the existing landscape to use as a comparative basis of judgment. If no attachment to the existing landscape is present, the facility would be judged more on its quality than on cultural bias.

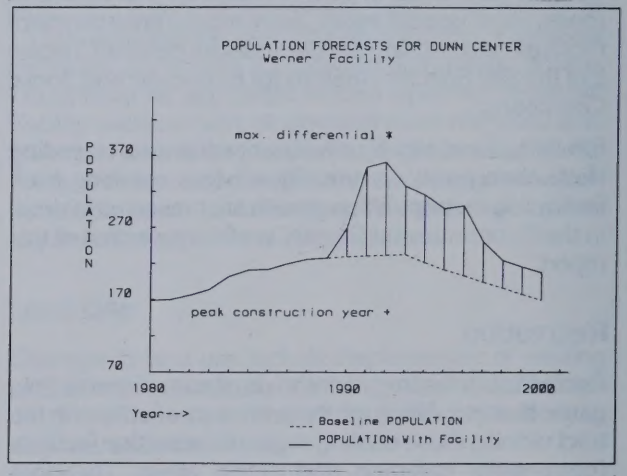
The visual impact would be the penetration of the skyline by the facility in views from communities and major transportation corridors. The 600-foot stack could potentially be seen thirty or more miles away. Powerlines originating at the site would have more extensive consequences. Consideration for corridor planning related to the placement of facilities is essential to maintain visual quality in the region. The facility would be highly visible and would demand a response either positive or negative. The dominance of the facility in the landscape could be perceived as a loss of amenity through impairment of the landscape as it now exists for the forty years of the facility's expected life.

Economic and Social Conditions

Construction and operation of the Werner Facility would result in impacts upon services in some communities within the area as a result of population growth associated with employment opportunities. Figure 3 shows forecasted community employment and population levels through the year 2000 both with and with-

FIGURE 3





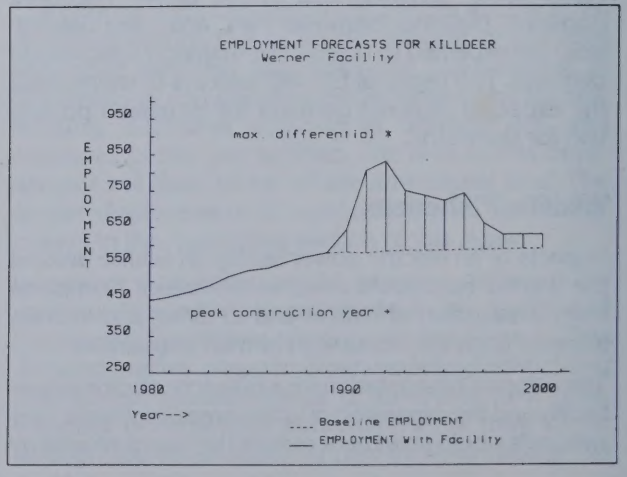
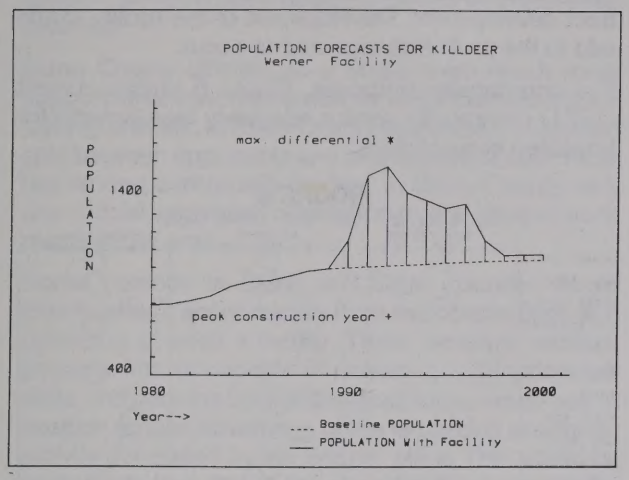
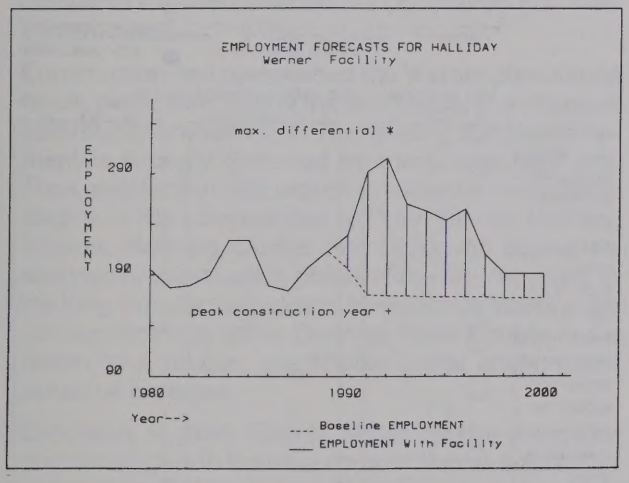
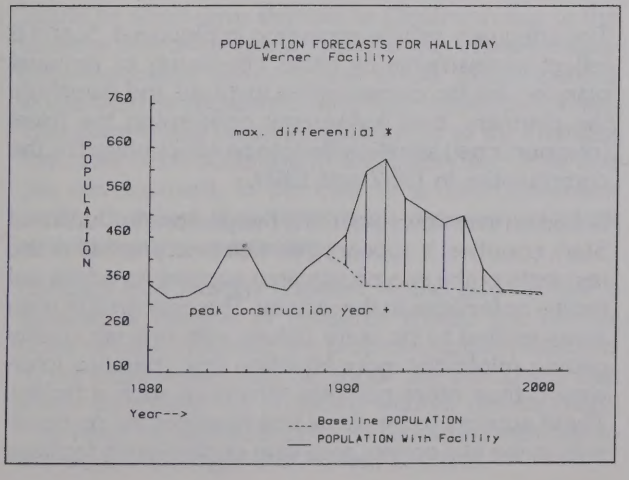
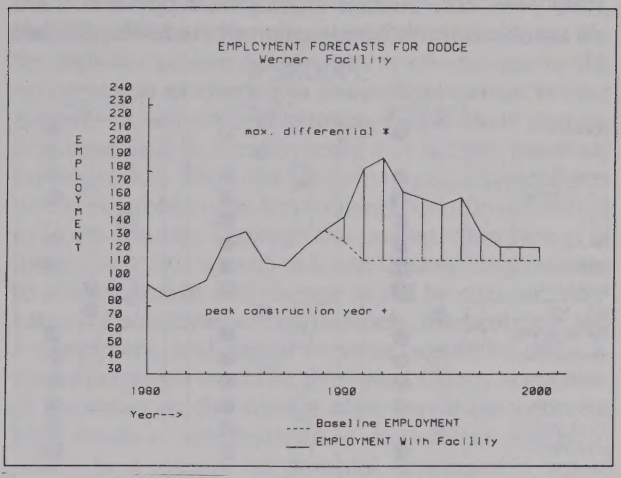


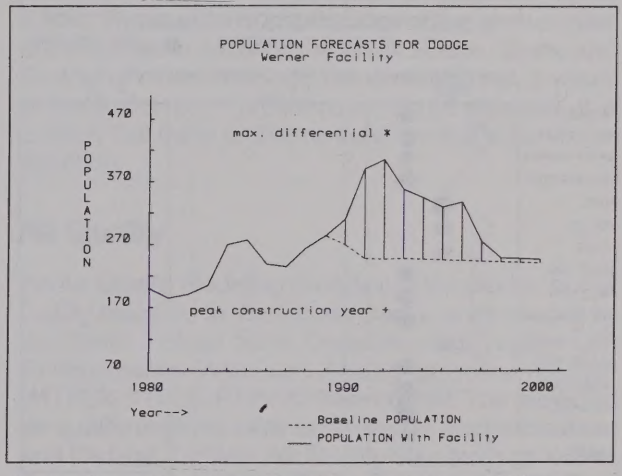
FIGURE 3 (continued)











SOURCE: Mountain West Research, Inc., 1981.

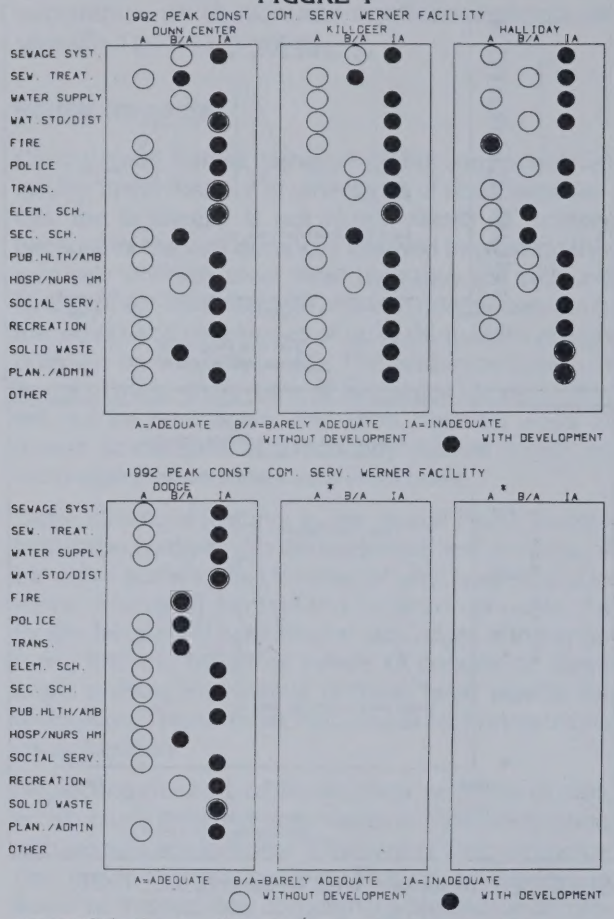
out development of the facility. As these figures show, Dunn Center, Killdeer, Halliday, and Dodge, North Dakota would experience increases in both population and employment as a result of development of the facility.

Changes in regional personal income from facility development are expected to be insignificant through the year 2000. The communities in which the workers and their families reside would experience some increases in economic activity as a result of employee payroll expenditures and through company expenditures for goods and services during the construction and operation phases. The facility is forecasted to boost regional personal income by a maximum of 2.2 percent over baseline values by 1992 as a result of expenditures associated with the construction phase of this facility.

Peak employment during the construction phase of the facility is expected to occur in 1992 at 1,248 employees with full operations employment expected in 1999 at 200 employees. Using these two years as the first primary impact date, it is estimated that the above communities would experience an inadequate level of one or more community services as a direct result of the

1992 peak construction employment/population levels associated with construction of the facility (Figure 4).

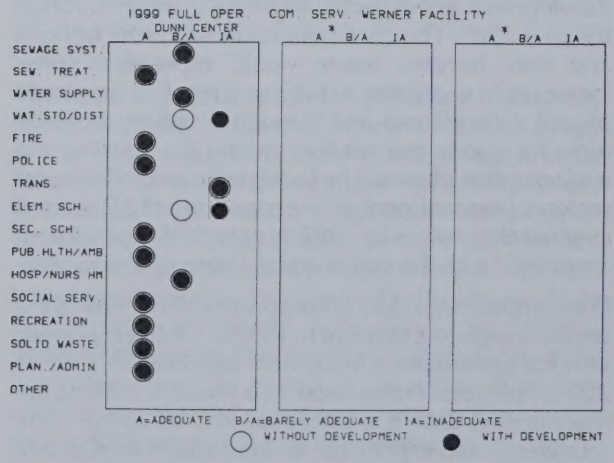
FIGURE 4



SOURCE: Respective city/county or regional planners.

Population associated with full operation (i.e., 1999 and beyond) of the facility is expected to cause water storage and distribution problems in Dunn Center as a direct result of facility development (Figure 5). Killdeer, Halliday, and Dodge would experience inadequacy of one or more community services by 1999 even without tract development. Development of the facility would add to the problems expected to occur.

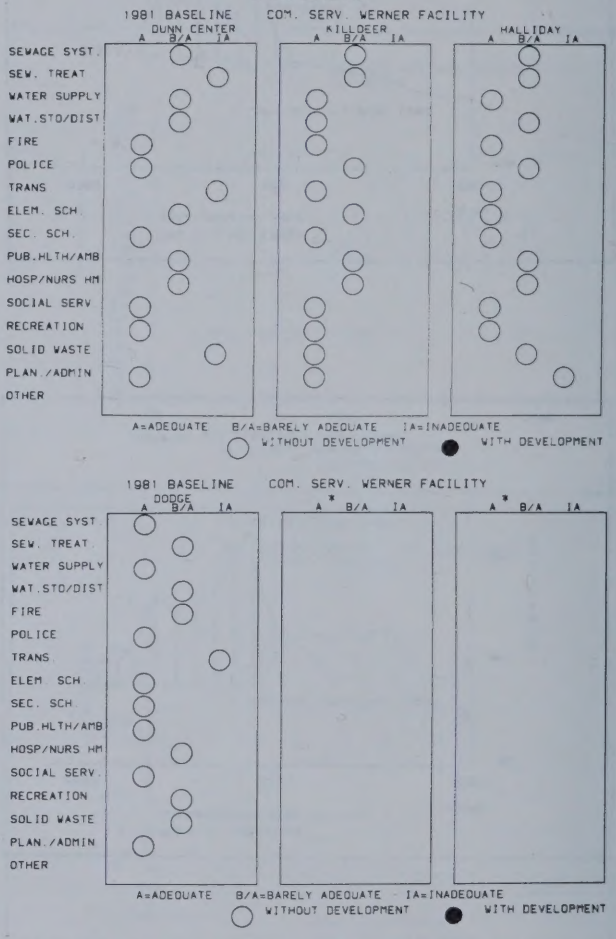
FIGURE 5



SOURCE: Respective city/county or regional planners

For comparison purposes, Figure 6 shows current (1981) community service adequacy assessments for impacted communities.

FIGURE 6



SOURCE: Respective city/county or regional planners

The adequacy ratings appearing in Figures 4, 5, and 6 reflect assessments by either city-county or regional planners for the communities involved and constitute the planners' best judgments concerning the fiscal (revenue/cost) situation likely to be encountered by the communities in 1992 and 1999.

Based on interviews with thirty-five persons in Dunn and Stark counties, it appears that well over one-half of the residents of the two-county area support an additional facility or facilities in the vicinity. The concerns in both areas tended to be quite diffuse with only air quality getting minimally more attention from persons interviewed than other potential effects of such a facility. There appears to be about one-fourth of the respondents in the two-county area who oppose such facilities

and this opposition emerges as more vigorous than support, which is often heavily qualified by interviewed persons.

Dunn County officials, as a whole, were much more supportive of coal conversion facilities than were Stark County officials. In Stark County there was a fairly even split between opponents and proponents of such facilities among community leaders. In Dunn County, only one official expressed opposition to the siting of such plants in the area.

Some persons in Dunn and Stark counties would clearly benefit economically from the construction and operation of such a facility. These persons, retailers, persons with or capable of acquiring appropriate job skills, and persons outside the labor force, would be in a position to take advantage of the expanded economic activity generated by the Werner plant. This would be particularly true during the short term but would also hold during the long term as well, to a lesser extent. Other residents of this area would not be able or capable of participating in an enhanced economic situation, but would experience an altered community due to its construction.

Construction and operation of the Werner plant would result, particularly during the short term, in a changed community environment. The existing social environment is strongly endorsed by many area residents. Thus, satisfaction with place of residence would likely decline in the communities of Dunn Center, Halliday, Killdeer, Manning, Dodge, and Dickinson during the short-term, construction phase of the Werner plant. In the long term, the population levels above baseline are not significant in either Dunn or Stark County and a return to a routine, predictable social environment would be expected.

Dickinson, in Stark County, would receive the major population growth from the construction and operation of the plant. Dickinson and Stark County are in a fairly solid position to deal with such growth because of recent experience with industrialization, a fairly broad population base, and a diverse economic base. There would be short term stresses in Dickinson due to the construction of the plant. Traffic, noise, impersonalization, unsociable behavior, and similar consequences would likely be apparent during the construction phase. This plant would be an additive factor to the changes that have been occurring in Dickinson due to oil and gas development. In the case of a coal conversion facility, it is not likely that these changes would be evident beyond construction.

Burleigh and Morton counties would also receive a substantial number of residents should the Werner plant be built. However, the projected growth attached to the plant would only be about one percent of that area's population as projected without development. Therefore, no significant effects should be attached to the plant in Burleigh and Morton counties.

Dunn County and the communities of Dunn Center, Halliday, Killdeer, Manning, and Dodge would be the location for substantial short-term effects due to the construction of the plant. Dunn County has limited experience with industrialization, has a small population base, and is, economically and socially, relatively homogenous. Thus, the short-term population effects would be problematic for residents and administrators in Dunn County. Through the construction period of the project, the capacity of Dunn County communities to absorb growth and change would be stressed. Allocation of public resources, (schools, medical care, law enforcement, and similar services) would be difficult. These problems would be short lived. Upon completion of construction, the Werner plant would not generate high levels of employment or population effects. A return to a routine nonstressful environment would follow. The long-term implications of the Werner plant are minimal in each of the areas (Dunn, Stark, and Burleigh-Morton counties) being considered. It would present short-term problems for some residents. It is unlikely that these problems would persist beyond construction.

Air Quality

An Air Quality Modeling Analysis[1] of the electric power facility assigned to the Werner tract was conducted by the North Dakota State Department of Health. U.S. Environmental Protection Agency guideline models[2] (MTPER, PTPLU, PTMAX) were utilized. The projected air quality impacts were compared to applicable State and Federal Ambient Air Quality Standards as well as State Prevention of Significant Deterioration (PSD) of air quality increments. The three major air pollutants emitted from the facility—sulfur dioxide (SO_2), Total Suspended Particulates (TSP), and nitrogen dioxide (NO_2)—were compared to the applicable standards.

The assigned electric power facility was shown to comply with all State and Federal Ambient Air Quality Standards. It was also found to be in compliance with all State PSD increments.

[1]Guidelines for Air Quality Maintenance Planning and Analysis Volume 10 (Revised): Procedures for Evaluating Air Quality Impact of New Stationary Sources, EPA-450/4-77-001, October 1977, (OAQPS No. 1.2-029 R), U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711.

[2]Guideline on Air Quality Models, EPA-450/2-78-027, OAQPS No. 1.2-080, April, 1978, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711.

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The Tenneco Coal Gasification Company; P.O. Box 491, Glendive, Montana 59330.

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